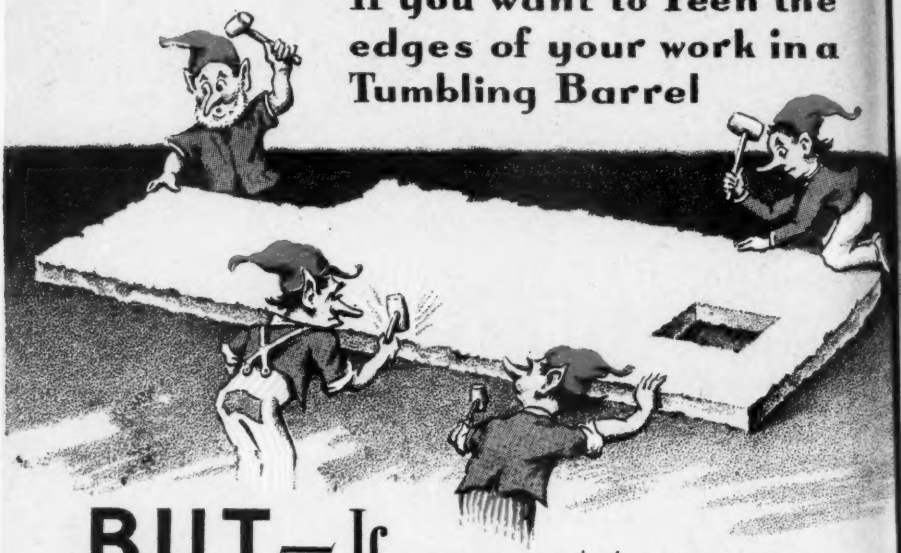
THE MONTHLY

Review

NOVEMBER · · · 1947

ITS YOUR BUSINESS

If you want to Peen the edges of your work in a Tumbling Barrel



BUT— If you want to remove the Burrs and put a smooth radius on your work then ——

ITS OUR BUSINESS

The New **SPEE-D-BURR** *

BARREL TUMBLING METHOD gives you radius blended edges and corners and grinds off the Burrs for soft metals as well as hard.

* PAT. PENDING

FREDERICK **GUMM** *Chemical Company- Inc.*

538 FOREST STREET, KEARNY, N.J.

Finishing and PROCESSES PRODUCTS of ENTHONE RESEARCH

TEAR OUT
Check and Mail for Latest Information on BETTER METAL FINISHING

FINISHING PROCESSES

ALUMON — a process for treating aluminum and its alloys to prepare it for electroplating with other metals.

ALUMOX — a process for chemically oxidizing aluminum to impart protection to corrosive atmospheres and prepare it for organic finishes.

EBONOL "C" — a process for chemically oxidizing and blackening copper and copper alloys. The finish is also a good base for painting.

EBONOL "S" — a chemical process for blackening iron and steel operated in the temperature range from 285-290°F.

EBONOL "Z" — a process for blackening zinc and zinc alloys.

FINISHING PRODUCTS

Aids for Better Pickling

ACID ADDITION AGENT — a surface active material which is added to hydrochloric and sulphuric acid pickles to prevent fuming, to inhibit attack upon the steel and promote better pickling.

INHIBITOR 7C — a powerful inhibitor for hydrocloric acid pickles either hot or cold to prevent attack upon base steel. The inhibiting action is approximately 99%.

an organic material which is added to hot water used for drying after pickling to prevent rusting or yellow staining of steel. No film is left upon the work to interfere with organic finishing.

Better Cleaning

ALUMINUM CLEANER E — an etching type cleaner for cleaning aluminum as well as etching.

ALUMINUM CLEANER NE — a powerful cleaner for cleaning aluminum without any attack or tarnish.

BRASS CLEANER — a powerful cleaner but has a mild action on brass, nickel-silver, lead-tin alloys, steel and other metals.

CLEANER 100 — an alkali cleaner of very high detergency for cleaning steel by soaking or electrolytic means.

EMULSION CLEANER — an emulsifiable solvent type cleaner for removing all solid dirt and oil as well as buffing compositions from all metals without attack or tarnish.

STRIPPERS

ENAMEL STRIPPERS: Various solvent and emulsion type strippers are available for rapidly removing enamels, lacquers and other organic coatings from all metals without attack.

ZINC STRIPPER — an alkaline process for rapidly stripping zinc plate from steel without any attack upon the steel.

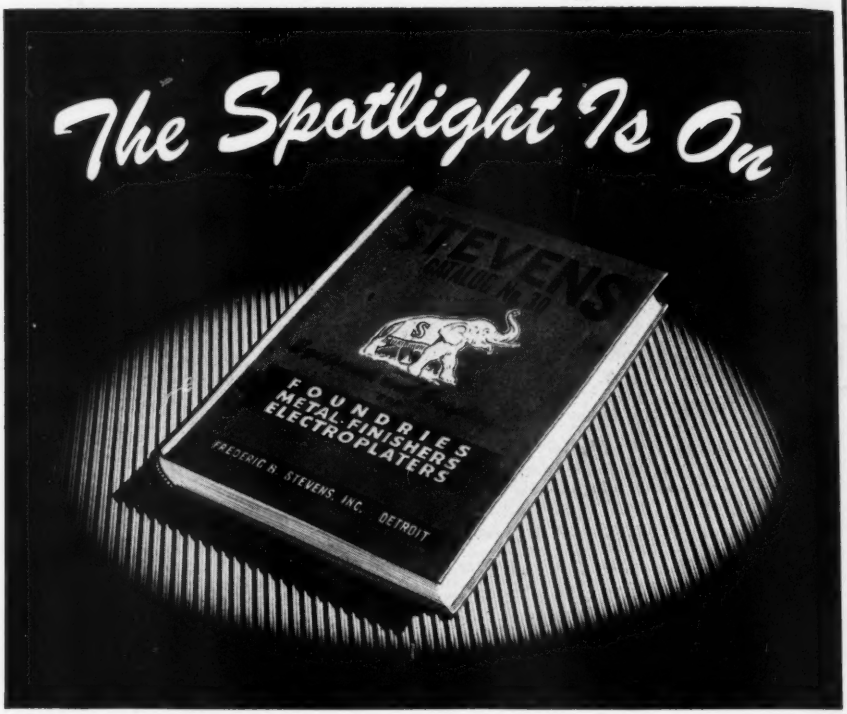
RUST-PROOFING MATERIALS

NO. 15 OIL — a thin film oil for rust-proofing of steel. Protects 24 hours in salt spray and is a water shedding polar type oil.

SOLUBLE OIL — an emulsifiable rust-proofing oil used diluted with water to apply a rust-proofing film. Can be used with hot or cold water. Also an excellent cutting oil.

1568 WAX — an emulsion of clear hard-drying waxes to produce a hard rust-proofing finish on metals. Air dries fast and does not rub off.

ENTHONE INC. ENTHONE



Our New Catalog No. 30—prepared as a service to metal finishers—is the most complete and up-to-the-minute book of its kind ever published . . . a veritable

METAL FINISHING ENCYCLOPEDIA

It is truly much more than a catalog of equipment and supplies, for within its pages is an accumulation of information embodying advanced developments in modern metal finishing practice.

The edition is sufficient to supply a copy to every metal finishing plant in the United States and Canada. Distribution is just beginning, and will be completed within a few weeks.

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- CANADA FREDERIC B. STEVENS OF CANADA, LIMITED
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  - 2368 Dundas St., West Toronto, Ontario

THE MONTHLY

Review

VOLUME 34 NOVEMBER, 1947 NUMBER 11

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Published monthly at 5800 N. Mervine Street, Philadelphia 41, Pa. Official Organ of the American Electroplaters' Society. Executive Offices: P. O. Box 168, Jenkintown, Pa. Phone: Ogontz 4663. **Subscriptions:** Domestic and Canada, $3.00 per year, 50c per copy. Foreign, $4.50 per year, 75c per copy. Entered as second class matter July 1, 1946, at the Post Office at Philadelphia, Pa., under Act of August 24, 1912. Copyright 1947 by American Electroplaters' Society, Inc.

BRIGHT-SPEEDY LOW-COST ZINC PLATING

WITH DU PONT CHEMICALS AND PROCESSES

DUPONT "ZINC-LYTE"
zinc deposits direct from the bath *without bright dipping!*

pure zinc on steel surfaces of almost any size or shape!

DU PONT "ZINO-O-LYTE"

zinc deposits direct from the bath *without bright dipping!*

- **high operating efficiency at both high and low current densities.**
- **baths easily made up from prepared salts.**
- **suitable for all types of zinc plating, particularly barrel plating.**
- **satisfactory for use with almost any types of ferrous metals.**

pure zinc on steel surfaces of almost any size or shape!

- **low in cost.**
- **bath made up easily from standard chemicals.**
- **easy to operate and control—gives good results under a wide range of operating conditions.**
- **rapid rate of deposition with high allowable current density.**

Ask your Du Pont technical representative to give you complete details on how these Du Pont Zinc Plating Processes can save you time, trouble and cost! Or write to the Electroplating Division, E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware.

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Chemicals · Processes · Service
for ELECTROPLATING

DU PONT — BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

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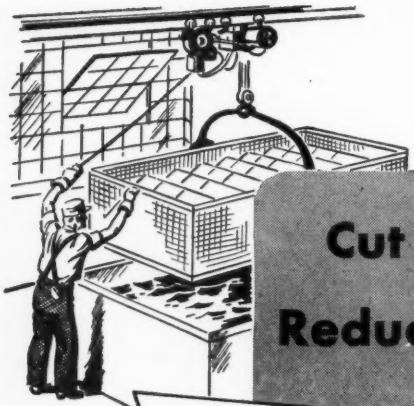
Electrochemicals Dept.
Wilmington 98, Delaware

Please send ☐ "Durobrite Zinc Plating"
☐ "Zino-O-Lyte Zinc Plating"

Name _____

Firm _____ Title _____

Address _____



Cut Cleaning Time
and
Reduce Cleaning Costs
with

Cowles
SOAKLEEN
Liquid Emulsion Cleaner

COWLES TECHNICAL SERVICE
gladly furnished upon request.

Cowles SOAKLEEN does a real job of removing stubborn soil and oils from metal parts in pre-soak cleaning. All following cleaning operations are reduced to a minimum.

SOAKLEEN works unusually well for cleaning steel before enameling, plating and other finishes.

SOAKLEEN is simple and easy to use, is non-toxic, cuts cleaning time and reduces cleaning costs. Place a trial order today—orders shipped promptly from convenient warehouse stocks.

Package—55 gal. non-returnable steel drums.

The Cowles Detergent Company

METAL CLEANER DEPARTMENT
7016 EUCLID AVENUE CLEVELAND 3, OHIO

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NON-FE
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F.L.&J.C.
COMPANY
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DETROIT

SAVE ON WHEELS . . . STEP UP PRODUCTION

Speeds from 1,500 to 3,000 RPM are instantly available with the turn of the dial while the lathe is in operation. Polishing and buffing (cut-color-satin) can be done on one machine with no delays or lost motion.

The Hammond VRO Variable Speed Polishing Lathe definitely will step up production and improve finish. Maximum wheel economy is assured, too, because efficient peripheral speed can be maintained at all times — wheels can be used right down to the flanges before discarding.

Hammond

VRO

VARIABLE SPEED

POLISHING

AND

BUFFING

LATHE

the DIAL does it

WRITE FOR CATALOG 55!
Catalog showing all Hammond polishing lathes, abrasive belt, "OD" and automatic finishing machinery gladly sent on request. Write today!

Hammond of KALAMAZOO
GOOD MACHINERY SINCE '82

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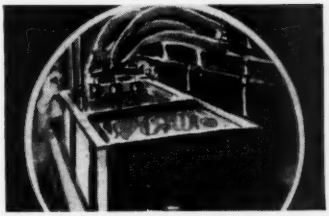
LO·HI pH

BETTER ... FASTER ... LOWER COST CLEANING

Due to a recent improvement in product . . . in method of charging . . . in control . . . our "Lo-Hi" pH Cleaning Process is better today than ever . . . Whether manually operated or fully automatic, if your plating procedure is orthodox, "Lo-Hi" will do your job better—faster and at lower cost regardless of type of steel or soil . . . Let us prove it at your convenience and if you are not convinced—it will be at our expense.



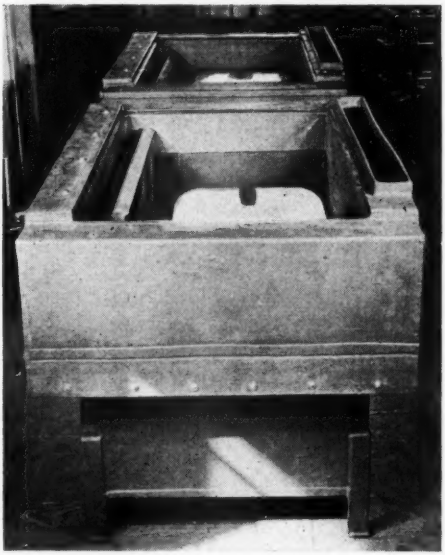
LO·HI

NORTHWEST CHEMICAL CO.

9310 ROSELAWN DETROIT 4, MICH.

pioneers in pH cleaning control—serving you since '32

Built for years of severe service



STORTSWELDED tanks with rubber linings give many years of trouble-free performance under severe acid conditions. The construction is most economical because it combines adequate strength with exceptional protection against corrosion losses. If you are planning for rubber linings it will profit you to consult with Storts engineers on suitable designs for large and small details.

STORTS WELDING COMPANY
INCORPORATED
42 Stone Street Meriden, Conn.

Manufacturers of Welded Fabrications to Specification

Outstanding!
McGEAN
BRIGHT NICKEL
PLATING PROCESS
Preferred for its:
• ECONOMY
• CONSISTENT PERFORMANCE
• EASE OF CONTROL
THE McGEAN CHEMICAL COMPANY
CLEVELAND 15, OHIO

REMOVE SCALE
FROM HEAT TREATED PARTS PRIOR TO FINISHING WITH

DIVERSEY EVERITE

Diversey Everite is a powerful solvent specially developed to remove heat scale quickly and completely without harming the sound metal. Will not change dimensions of forgings and castings. Also removes rust from metal surfaces. Reduces to a minimum any tendency toward hydrogen embrittlement. Economical . . . works only on oxide and unwanted deposits . . . not on the metal. Easy to use by soak or circulating method.

REDUCES HYDROGEN EMBRITTLEMENT

Here's proof—Place a small wad of steel wool in graduates filled with Diversey Everite and raw acid. Note how the steel wool is carried to the surface by bubbles of hydrogen released by the raw acid. In the Everite solution, the steel wool remains at the bottom . . . there's no evolution of hydrogen, no corrosion.

WILL NOT INJURE METAL SURFACE

Here's proof—Select two rusty pieces of steel. Place one in a solution of Diversey Everite and the other in raw acid. Note how Everite removes the rust quickly and completely, AND THEN STOPS. However, the raw acid continues to dissolve the sound metal after the rust is gone.

Four Outstanding Advantages

1. Reduces danger of hydrogen embrittlement.
2. Removes heat scale and rust quickly, completely, and safely without harming the sound metal. Will not change dimensions of forgings and castings.
3. Everite is economical . . . it takes less to do more!
4. Easily diluted with water for strength required.

DIVERSEY
Surface Preparation Service
FOR THE METAL INDUSTRIES

FOR BETTER RESULTS USE EVERITE HERE!

- Remove heat scale prior to grinding and polishing. Saves wheels and cuts finishing time.
- Strip galvanize, zinc plate and cadmium plate leaving base metal intact.
- Remove rust and scale from springs prior to plating. Reduces any tendency toward hydrogen embrittlement, blistering and failure in service.

THE DIVERSEY CORPORATION, 53 West Jackson Blvd., Chicago 4, Illinois

RELIANCE
VARIABLE SPEED
LATHES

Reliance Variable Speed Lathes Cut Costs

There is a RELIANCE LATHE for every need.

Let us quote on your requirements.

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Plating and Polishing Machinery

Complete Plating Plants Installed

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Filter All Plating Solutions Faster, More Completely in

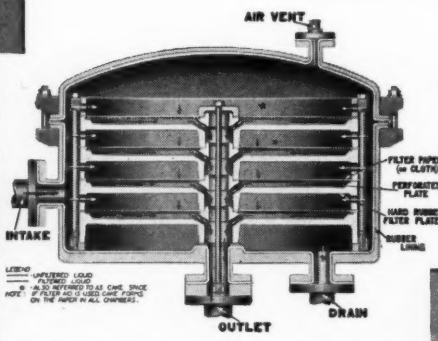
SPARKLER
Horizontal Plate
FILTERS

Because the filter cake is held horizontally, it is absolutely stable to the end of each filtering cycle. And cycles are longer because the cake retains its porosity longer. That is why the "horizontal principle," as embodied in Sparkler filters, gives you more efficient, low cost, operation. Sparkler filters are pressure-tight and leak-proof, designed for intermittent or continuous operation.

4 Plating Solution Types

1. Rubber-lined for bright nickel
2. Stainless steel for acids
3. All Iron for alkaline solutions
4. All Steel (with Stainless Pump) for chromium

SPARKLER MANUFACTURING CO.
Mundelein, Illinois



Made in Capacities
60 to 10,000 G.P.H.

See your supplier or Write for details

Our Engineering Service is available for any specialized problems.

SINGLE NICKEL SALTS

As close to you AS THE

NEAREST HARSHAW BRANCH

WHEN you order Harshaw Single Nickel Salts, speed up delivery by sending your order to the Harshaw branch nearest you.

Ample stocks are on hand to fill your order promptly.

Cleveland 6, Ohio	1945 East 97th St.
Chicago 11, Ill.	445 Lake Shore Drive
Cincinnati 2, Ohio.	American Building
Detroit 27, Mich.	9240 Hubbell Ave.
Houston 2, Texas	Mellie Esperson Bldg.
Los Angeles 14, Calif.	609 S. Grand Ave.
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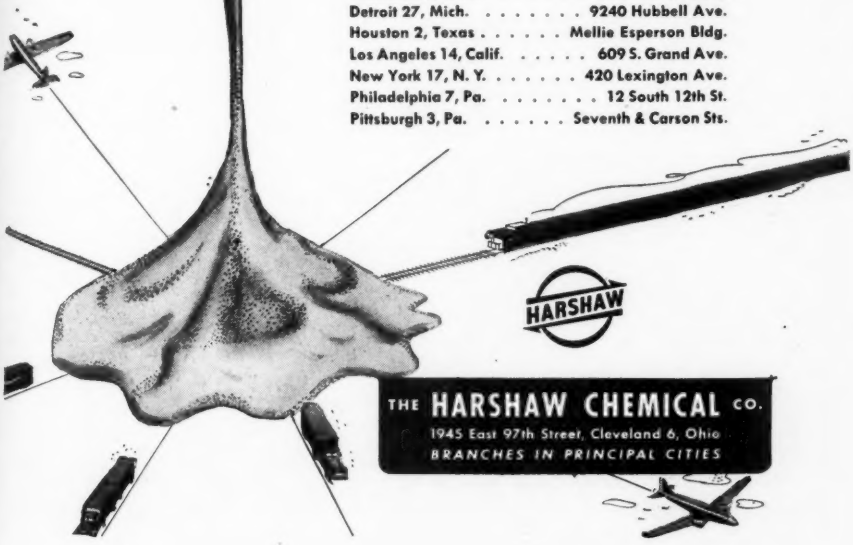
Pittsburgh 3, Pa.	Seventh & Carson Sts.



HARSHAW

THE HARSHAW CHEMICAL CO.
1945 East 97th Street, Cleveland 6, Ohio
BRANCHES IN PRINCIPAL CITIES

For More Economical Speed Plating

LASALCO'S RICHARDS BARREL PLATER

★ Nothing plates but the load.

★ Selective 3-speed drive.

★ Easily, quickly cleaned negative connection, separated from hanger arms, brought direct to work through hollow hub.

★ Heavy, flexible dangler imbedded in load gives perfect contact.

★ Negative contact can be arranged to carry up to 800 amps.

★ Cylinder when lowered goes automatically into exact position thus engaging driving gears and electrical contact without operator's attention.

★ Anode rods, conductors, connections and switches are completely insulated from tank.

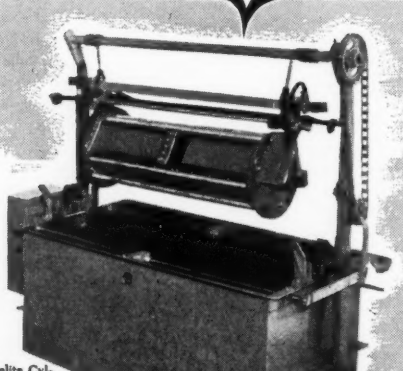
★ Cylinder construction of 5/16" laminated canvas Bakelite or 3/8" hard bronze rubber (as illustrated). Special rod or woven types also available.

★ Sizes, 12" (across flats) by 24", 30", 36" and 42" long for 24, 30, 36, or 42 qt. loads.

★ Gear or sheave drive.

★ Hand or tackle hoist. Ratchet device holds cylinder in only desired position.

★ Effortless, speedy raising, loading, lowering or unloading.



Motor Drive. Bakelite Cylinder with 5/16" Panels. Slide Doors Hand Hoist. Gear Driven (or Sheave Drive if requested).

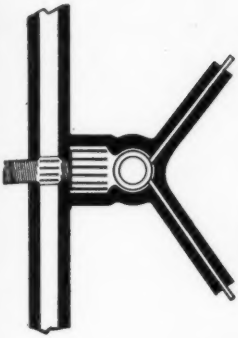
For More Production—Faster—Better—More Profitable—Use Lasalco's Richards Barrel Plater

MEMO
Call a Lasalco Engineer

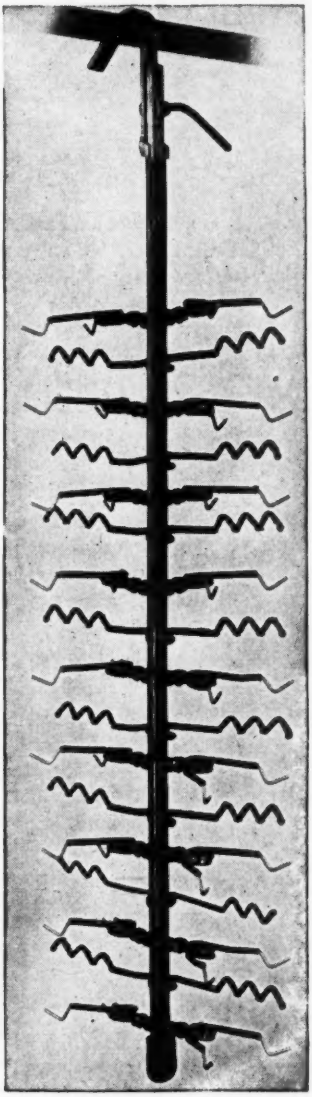
Send For Catalog Information Today

LASALCO, INC.

2818-38 LA SALLE STREET ST. LOUIS 4, MISSOURI



RACKS IS OUR BUSINESS



We know racks. We make better racks. That's our business . . . better racks for electroplaters. We've made them scientifically for over nine years. And we make all kinds of racks for every kind of plating job.

Here's an example. Standard Plating Rack Company makes the Du-All Universal Plating Rack. This is a single rack with a multiplicity of uses . . . an all-purpose plating rack offering platers the latest design in efficiency and economy.

The Du-All provides holding attachments that accommodate a wide variety of shapes and sizes. Adjustable for regular or specialized plating jobs. Permit practically all inside and outside plating requirements. Speed production. Cut costs.

The Du-All has Stand-It-All Flexible Insulation. This insulation, featured on most of Standard's racks, prevents robbing of current . . eliminates plating material loss. A perfect insulation in all standard solutions.

Another feature of this rack is the Du-All Anode Rack Attachment which insures efficient inside plating. And excessive current is no problem when the Du-All is used with the Insulated Octopus Feeder.

Scientific development has made the Standard Du-All Plating Rack indispensable in your shop. All of our racks are constantly being improved through research. Specify Standard when ordering racks.

STANDARD
PLATING RACK COMPANY
1913-1925 North Paulina Street
Chicago, 22 Ill.

"Me . . . Interested in Scientific Surface Preparation?"

Maybe not you, Mr. Conductor. But the fine finishes on trumpets, cornets, tubas, cymbals and other plated musical instruments prove that platers *are* interested. And platers have learned from experience that Oakite materials for cleaning-before-plating provide surfaces to which electroplates adhere tenaciously.

Platers! Just a Reminder: Specially designed for the job, Oakite materials and methods remove grease, shop dirt, fabricating compounds in double time . . . lend harmony to surface preparation procedures . . . put the soft pedal on rejects . . . set the key for the production of sales-appealing finishes.

Oakite Opus: You can listen to the Oakite opus . . . see Oakite materials actually cleaning right in your plant. Just get in touch with the Oakite Technical Service Representative for rehearsal runs with Oakite materials.

OAKITE PRODUCTS, INC., 40 Thames St., NEW YORK 6, N. Y.
Technical Service Representatives in Principal Cities of U. S. & Canada

OAKITE
REG. U. S. PAT. OFF.

Specialized Industrial Cleaning
MATERIALS • METHODS • SERVICE

BUT . . .

The motor-wise public of this generation demands the best in automotive engineering. Where aluminum — and its alloys — are being processed

Alodizing* With Alodine*

is as drastic an improvement over methods of the past — as today's automobiles are over the horseless carriage. "ALODINE"-coated and sealed aluminum — either painted or unpainted — is effectively protected. "ALODINE" requires no electricity or special skill — no high temperatures. In two minutes, or less, the job is finished. ALODIZED* aluminum is highly corrosion resistant — provides a tenacious bond for paint — saves time and labor — and reduces production costs.

CHEMICALS ACP PROCESSES

RUST PROOFING AND PAINT BONDING

Granodine *
Duridine *
Alodine *
Lithoform *
Thermoil-Granodine *

RUST REMOVING AND PREVENTING

Deoxidine *
Peroline *

PICKLING ACID INHIBITORS

Rodine *

* "ALODINE" ® for Metal Coating Chemicals

AMERICAN CHEMICAL PAINT CO.
AMBLER ACP PENNA.

Hello...

Here's Another Fine Product Finished with Egyptian

Stromberg-Carlson is a stickler for quality in finish as well as in everything else.

So the fact that they rely upon Egyptian for the base of their 1243 telephone is significant to every manufacturer with whom finish is a factor.

Whatever your finish requirements, you can rely on Egyptian.

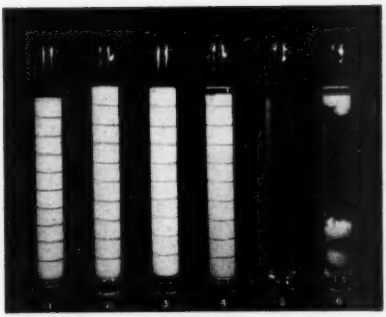
THE EGYPTIAN LACQUER MANUFACTURING COMPANY

SPECIALIZED PRODUCTION FINISHES

P. O. BOX 444 NEWARK, N. J.

Emlon ranks high in the metal-cleaning field!

Wyandotte Emlon is a new detergent of the solvent emulsion type. This versatile product is especially made to meet *all* requirements for such a cleaner—as determined by the experience of Wyandotte Service Engineers.



Unretouched photograph showing the comparative stability of Emlon (1, 2 and 3) and a leading competitive product (4, 5 and 6).

Illustrated are the following 5% emulsions, after standing for 24 hours:

(1) Emlon in tap water; (2) Emlon with 2.5% of sulfuric acid added; (3) Emlon with 2.5% of caustic soda added; (4) Competitive product in tap water; (5) Competitive product with 2.5% of sulfuric acid added; (6) Competitive product with 2.5% of caustic soda added. Note separation, or complete breakdown, of 4, 5 and 6.

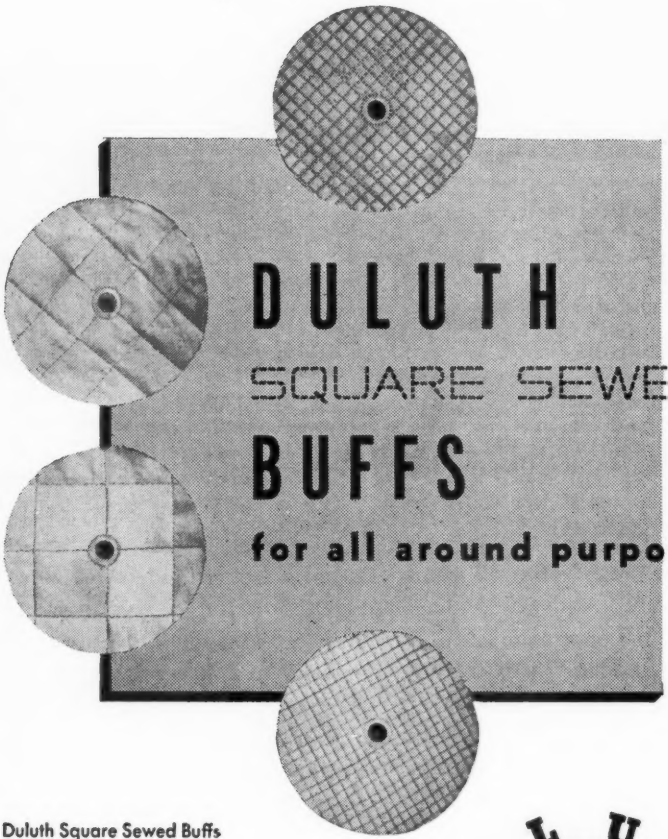
This illustrates the unusual *stability* of emulsions formed with Emlon. This stability results in better and faster cleaning action, longer cleaning solution life and low cleaning costs.

Ask your Wyandotte Service Engineer about this new and different product and its many applications—or write directly to us for descriptive literature.

Wyandotte
REG. U. S. PAT. OFF.

WYANDOTTE CHEMICALS CORPORATION
WYANDOTTE, MICHIGAN • SERVICE REPRESENTATIVES IN 88 CITIES

On the Square



Duluth Square Sewed Buffs are made in varying degrees of square sizes. The sewings will vary from ¼" to 4" squares, dependent upon your requirements. They are also made of various grades of materials, just as other full disk or pieced buffs. The square sewings, of course, afford substantial savings in wearing and in the more economical use of abrasives that are preserved in the square sewed pockets.

DULUTH
BUFF COMPANY
DULUTH, GA.

Write for Complete Information Today.

PENNSALT

Percent of active and inert ingredients in leading metal cleaning compounds, based on analyses of representative samples.

PENNSALT CONCENTRATED CLEANERS GIVE YOU 20% MORE ACTIVE INGREDIENTS

A LOOK AT THE CHART . . . some quick arithmetic . . . and you find that the average water content of the leading metal cleaners runs about 26%.

NOW LET'S ASSUME you've just bought 100 pounds of this "average" cleaner at 10¢ per pound. You've *really* bought only 74 pounds of *cleaner* . . . the remaining 26 pounds are just plain water! At 10¢ per pound, the cost of that water comes to more than 80¢ per gallon!

THAT'S A PRETTY FANCY PRICE to pay for H_2O. And it's a pretty good reason to make sure you buy the cleaner having the highest percentage of *active ingredients*. One more glance at the chart tells you Pennsalt leads on that score . . . with 20% higher active ingredient content than the average of all the leading cleaners!

YOUR PENNSALT REPRESENTATIVE can point out many other worth while, cost-cutting features of Pennsalt Cleaners . . . superior cleaning, rinsability, conductivity and lasting power. Let him run a test in your plant.

Special Chemicals Division
Pennsylvania Salt Manufacturing Company
1000 Widener Bldg., Phila. 7, Pa.

PENN SALT

WICO
PLATING
BARRELS
● First Revolutionary Improvement in Plating Barrels in 20 Years!!
Latches.
ONE PIECE SPIRAL CYLINDER CON-
STRUCTION. Steel with vulcanized rubber
eliminated.
BARREL IS ROTATED throughout cleaning

Latches.

ONE PIECE SPIRAL CYLINDER CONSTRUCTION. Steel with vulcanized rubber covering.

NO RINGS OR PINION GEARS. Rotates on rubber Vee belts.

eliminated.

BARREL IS ROTATED throughout cleaning and plating cycle.

COMPLETE FLOW of solution through work at all times.

Note these Striking Specifications:

Cylinders are semi-hard vulcanized rubber covered over steel construction.
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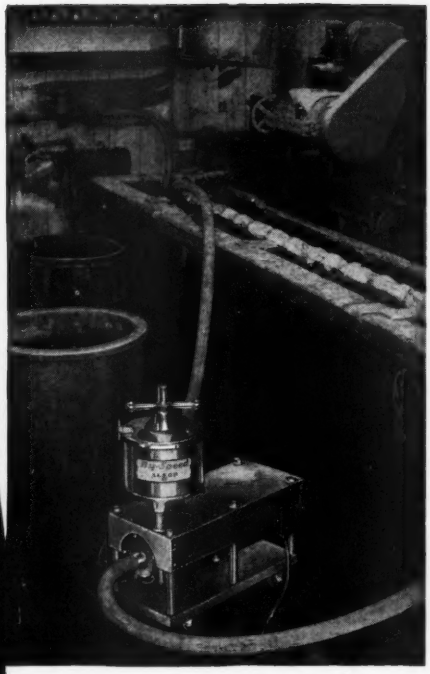

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THE MONTHLY
Review

EDITORIAL

TURNING OVER A NEW AND LARGER LEAF

New name . . . new size . . . new features will distinguish this journal beginning with the New Year.

Of *a new name*, some of our friends may say, "Why change?" and cite the Bard's oft quoted words, 'What's in a name? That which we call a rose by any other name would smell as sweet" . . . and we would bow and say, "Thank you, kind sir, for mentioning the rose." But even Shakespeare would rebel, were the rose called "The State Flower of New York, North Dakota and Iowa". "THE MONTHLY REVIEW of the American Electroplaters' Society" frankly is such a name, . . . not very descriptive and certainly long and clumsy.

The name of *PLATING* was chosen by the Executive Board of the Society by means of a New Name Contest (August issue) conducted among the members. It was chosen from 132 entries and was proposed by Robert E. Moore, 51 Forest Hill Road, West Orange, N. J., a member of the Newark Branch and recipient of the $50.00 prize for his winning entry.

The new size will be 8¼ x 11¼ inch trim and 7 x 10 inch type area. This size has two advantages. First: to our readers, permitting better treatment of editorial matter, photographs, drawings, charts, graphs, etc, the use of larger, more readable type, and the inclusion of more technical articles. Second: to our advertisers, because it provides more

space per unit for their selling message and, at the same time, saves them hundreds of dollars yearly by eliminating the necessity of special size plates. This new size, incidentally, is that which was standardized several years ago by the National Industrial Advertisers' Association as the most practical and has since been adopted by the leading industrial and technical publications.

Further, the *Staff of Associate Editors*, largely responsible for furnishing suitable articles, will be increased to include experts in allied fields . . . a step which will assure even better coverage of our readers' varied interests.

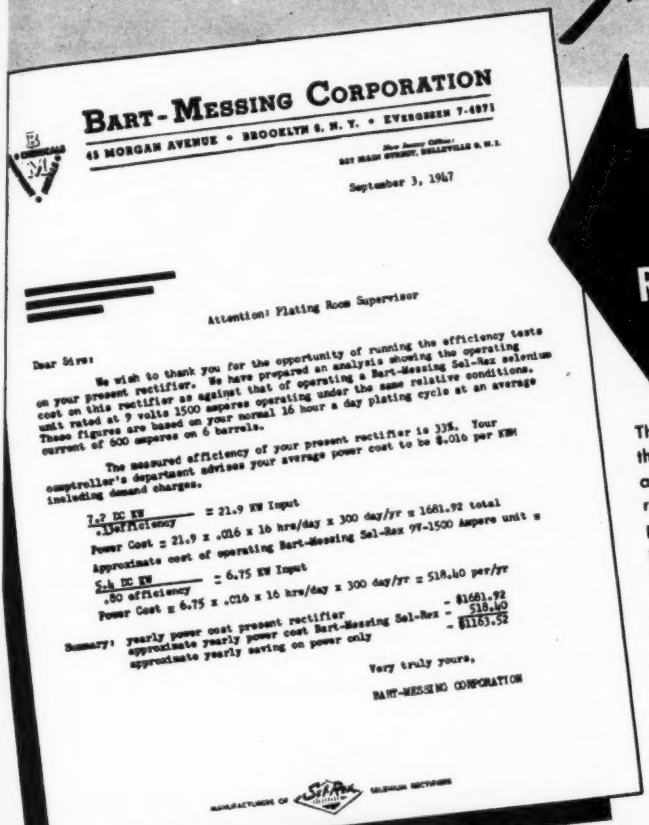
The tremendous growth of the A. E. S. in size and inflence, a growth due to the never-ending search by its members for more comprehensive knowledge and a better understanding of the very complicated art of plating, is evidenced in the growth of this magazine, its official organ.

We feel that these changes . . . our turning over a new and larger leaf . . . reflect this expansion and will be an inspiration for even greater effort.

Gustaf Soderberg

Editor

IS IT POSSIBLE TO OBTAIN A Sel-Rex selenium rectifier Free?



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September 3, 1947

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Dear Sirs:

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The measured efficiency of your present rectifier is 33%. Your comptroller's department advises your average power cost to be $.016 per KWH including demand charges.

7.2 DC KW / .33efficiency = 21.9 KW Input

Power Cost = 21.9 x .016 x 16 hrs/day x 300 day/yr = 1681.92 total

Approximate cost of operating Bart-Messing Sel-Rex 9V-1500 Ampere unit =

5.4 DC KW / .80 efficiency = 6.75 KW Input

Power Cost = 6.75 x .016 x 16 hrs/day x 300 day/yr = 518.40 per/yr

Summary: yearly power cost present rectifier - $1681.92
approximate yearly power cost Bart-Messing Sel-Rex - 518.40
approximate yearly saving on power only - $1163.52

Very truly yours,

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SOURCES OF IMPURITIES IN ELECTROPLATING SOLUTIONS

MYRON B. DIGGIN

Technical Director Hanson-Van Winkle-Munning Company
Matawan, N. J.

In a previous paper* entitled "The Purification of Electroplating Solutions", the present author discussed the effects of metallic and organic impurities in plating baths and described impurity removal methods. In the introduction to that paper, a brief section was devoted to classification and sources of contaminating impurities. This section will be amplified in the present paper and discussed in a greater detail.

Impurities in electroplating baths may be classified as follows:

1. Inorganic impurities in solution
2. Organic impurities in solution
3. Solid and dispersed impurities
4. Gaseous impurities

Inorganic Impurities in Solution

A common source of metallic impurities is the *salts* used in preparing and maintaining a plating solution. In general, the quality of plating chemicals has improved considerably during the past decade, but a point has now been reached where the preparation of exceptionally high purity salts, ideal for the most exacting plating conditions, would necessitate charging a high premium. With the development of simplified methods for removal of impurities from solutions, it is less expensive for the plater to deal with impurities originating in the commercial salts than to pay a premium for a custom-made grade of salt. In dull-plating low current density baths, impurities brought into solution by the salts are not particularly harmful, but with bright plating high-speed solutions and with demand for the production of heavy deposits, many difficulties have been experienced.

In bright nickel solutions and in electroforming solutions, iron brought in with nickel salts has been the most troublesome impurity. To obtain maximum performance from such solutions, it is necessary either to oxidize and precipitate the iron by using hydrogen peroxide or by *p*H adjustment and aeration or else to remove it by selective electrolysis. Only in rare cases are copper and zinc present in salts in amounts beyond desirable limits.

Cadmium oxide used in preparing cadmium solutions may be found to contain lead or thallium or other less common metallic impurities. Commercial zinc cyanide is also of somewhat variable quality. Fortunately, metallic impurities such as copper and lead can be removed from a newly made solution by treatment with zinc dust or sodium sulfide. Preparing zinc solution with USP zinc oxide will eliminate the necessity for this preliminary treatment. Copper cyanide, copper sulfate, silver cyanide, and sodium and potassium cyanides of commercial grades are of sufficiently high purity to make purification of their solutions unnecessary, except for a few special processes.

As they corrode, *anodes* may liberate inorganic impurities in solution. Anodes purchased from reliable manufacturers and

Monthly Rev. Am. Electroplaters' Soc.* **33, 513 (1946).

dealers are made from virgin metals and are of high purity. However, because of shortages and delays in delivery, some plating establishments have attempted to cast anodes or have them cast in a local foundry from reclaimed scrap metals. Generally, the metals entering into these anodes are not laboratory-checked, and many cases of contamination have been reported as a result. In one recent case where anodes made from scrap cadmium were used, the deposits were black and powdery. An analysis of the anodes disclosed the presence of 0.6 per cent lead and smaller quantities of several other impurities.

The critical eye of the electroplater is being turned towards *water* as a source of plating troubles. In room temperature solutions, various troubles have been definitely traced to both the water used in preparing and maintaining plating baths and that carried into the baths by drag-in from preceding rinses. Unfavorable characteristics which might remain unnoticed in low current density baths are more evident in high current density solutions in which bright or heavy deposits are applied. Evaporation losses are high in elevated temperature baths; when water is added to compensate for these losses, the constituents originally present in the water become concentrated with the result that a soft water does, in effect, become hard water and hard water becomes abnormally hard in the plating tank. Soluble mineral constituents usually brought into the solution with water are iron, aluminum, calcium, magnesium, sodium, potassium, silicon, carbonate, sulfate, chloride, and possibly phosphates.

Metallic dusts have often caused contamination of plating solutions. In one case, a rubber lined tank was thoroughly cleaned prior to preparing a nickel solution, but since electricians completing bus bar connections did all their drilling and filing over the tanks, heavy copper contamination resulted. In another case, a bright zinc solution in a full automatic conveyor was a never-ending source of trouble because of copper contamination. Two observations were made in going through this plant: (1) one's hair became covered with aluminum dust from grinding operations on aluminum propeller blades, and (2) there was considerable gassing throughout the bath even when current was not flowing. The difficulty was caused by aluminum dust settling on the solution where it dissolved with gassing in the highly alkaline bath. The aluminum alloy contained 3 per cent copper.

Chemical and electrolytic action on *tank walls* in unlined metallic tanks is a frequent source of trouble. Brass, copper, zinc, cadmium, and silver solutions are customarily contained in unlined steel tanks. Under certain conditions, namely, low *p*H, presence of chlorides and the tank in circuit through bipolarity, iron goes into solution with the formation of ferrocyanides. In many instances the ferrocyanide becomes concentrated enough to precipitate. Aside from its effect on deposits, ferrocyanide interferes with chemical analysis of the solution. There is a distinct trend toward use of rubber or synthetic lined tanks for alkaline plating solutions because they eliminate the danger of contamination from tank walls and, what is often overlooked, make it easier to control and direct the current.

During the recent war period, a great deal of trouble was experienced with copper contamination of alkaline zinc solutions. In many cases this was caused by plating solution dripping on *tank rods*. This condition was especially severe where intricate cup-shaped fuse parts were plated for half the period in one position, lifted out of the tank and emptied of solution *over the tank rods* and, after the rack had been turned 180°, plated for the remaining period. Slit rubber hose was fastened over the anode rods, or the rods were heavily nickel plated.

Every plater has experienced difficulties when *work* falls from racks and is allowed to remain *on the bottom of the tank*. In one plant having trouble with nickel deposits, an eight-inch layer of steel flatware was found on the tank bottom; the solution analyzed 2 oz/gal of nickel and 2 oz/gal of iron. Copper articles, brass parts, and zinc base die castings are especially troublesome when dropped in bright solutions. The

throwing power of a cadmium bath used for plating copper terminal lugs became so poor that the lugs were only partially covered. An investigation disclosed that each time the plating barrels were loaded, a handful of lugs missed the barrel opening and fell to the bottom of the tank; an analysis of this solution disclosed a cadmium content of 2.0 oz/gal and a copper content of 1.5 oz/gal.

A source of impurities more difficult to deal with is the *dissolution of metals* while they are *being plated.* As a rule a properly racked article in good electrical contact with the cathode rod becomes covered with the depositing metal. In some cases, however, especially with hollow articles, bipolarity may cause certain areas to become anodic and dissolve. A poor contact can also cause the same phenomena through a difference in potential between adjacent parts. During plating, tubular articles are subject to constant chemical attack and, in case of zinc die castings, also to electrochemical replacement.

In plating tubular steel furniture, dissolved iron can be controlled by continuous purification. Recently, however, there has been a tendency to use high tensile 3 per cent chromium steel tubing with thinner walls to save considerable weight. The relatively small amount of hexavalent chromium entering into solution causes a marked decrease in the efficiency of the bath and also peeling of deposits, a readily appreciated serious problem. Studies were made in one case to determine the weight loss during plating and the amount of chromium taken into solution. Fortunately, the formaldehyde used in the particular bright nickel solution reduced the hexavalent chromium to trivalent which was not particularly troublesome in the concentrations encountered; it was continuously removed by filtration along with precipitated iron, and the equilibrium reached in this bath after a considerable period of operation was only about ½ ppm of total chromium. Ferrous sulfate can also be used for reducing hexavalent chromium to the trivalent condition.

It may appear unnecessary to mention the addition of the *incorrect* type or grade of *salts* to an electroplating bath as a source of impurity, yet this happens frequently. Several instances have been observed recently: 1 oz/gal sodium nitrate was added to a bright nickel solution instead of boric acid, ½ oz/gal copper cyanide to a zinc solution in place of an equivalent quantity of zinc cyanide, sodium dichromate to a chromium solution in place of chromic acid, and a low-grade coal tar-derived ammonium sulfate to a bright nickel solution instead of a purified grade. In each case the result was disastrous. To eliminate such difficulties:

1. Purchase correct grade of chemical from a reputable manufacturer or dealer
2. Label or tag clearly each barrel or carton of chemical
3. Assign the responsibility of making additions to the plating tank to one person who is alert and intelligent
4. Never add the entire contents of a barrel or carton to the plating solution; always save a sample for checking purposes

Plating solutions can be contaminated with inorganic materials from pigments, such as cadmium sulfide, in *rack coatings* or from occlusions in defective rack coatings. Most modern rack coatings of the liquid type are pigmented with titanium dioxide which appears to be harmless. A rack coating that has cuts, blisters, or partially peeled areas may carry alkaline salts and pickle liquors containing metallic compounds into the plating solution. Several bad cases of contamination have been traced to this cause. Even with sound rack coatings, pickles and other preplating treatment solutions may be carried into the plating bath if rinsing is not thorough, especially in handling cup-shaped or intricate parts where rinse water is not replaced at a suitable rate.

With the widespread use of high speed bright plating processes, numerous cases of contamination have been caused by metals used in *accessory equipment* such as thermometers, pumps, heat exchangers, filters, piping, and fittings. Broken thermometer

bulbs containing mercury, sheaths on bimetallic thermometers in circuit, bronze pumps or bronze fittings in nickel plating equipment, etc., have caused many solutions to become inoperative. Recently a manufacturer was troubled with an exceptionally rough and dark-colored deposit from a cyanide copper solution. Nickel deposits would not adhere to it, no matter how thin it was applied or how the preparatory cycle of operations was varied. From the appearance of the deposit, it was judged that the solution was contaminated with lead; it was then found that the solution was being heated with lead-sheathed immersion heaters.

Among inorganic impurities are *decomposition or conversion products* of chemicals normally present in the bath. A specific case is the building-up of carbonate in cyanide solutions in which an excess certainly can be classed as an impurity.

Organic Impurities in Solution

Organic impurities may be formed in the solution by the *decomposition of brightening or wetting agents*. Either type of compound in overdosage can also be considered an impurity. The ideal brightener is one that exerts the desired influence at the cathode without undergoing spontaneous change or breakdown through oxidation or reduction at either electrode. Many organic wetting and brightening agents are changed by electrolysis into products which cause loss of brightness, ductility, efficiency, or conductivity or which narrow the bright plating range. Fortunately, the normal operating characteristics of the bath can in many cases be restored by adsorption of the breakdown products (along with a considerable proportion of active material) on activated carbon and clay. It is then necessary to recharge the bath with fresh brightener. Some decomposition products are not removed by activated materials but respond to oxidation treatment with hydrogen peroxide or permanganate. Chlorine gas is favored by a number of platers for continuous treatment; the concentration is maintained at 0.1 Normal. The writer has recently used bromine successfully in treating a particularly bad case of organic contamination. Prolonged electrolysis with insoluble anodes will often prove beneficial in oxidizing undesirable organic compounds.

A frequent and often unrecognized source of organic contamination is untreated *anode bags and filter cloths*. The textiles used for this purpose, unless given a special desizing treatment, may contain starch, gums, or sulfonated oils, which have been known to cause hard, brittle, and cracked nickel deposits. In purchasing fabrics to be used in contact with electroplating solutions, platers should insist upon the delivery of treated or tested materials.

There have been hundreds of cases where solutions have been contaminated by organic impurities extracted from *tank linings, connecting hose, filtration equipment, and rack coatings*. Today, as a result of extensive testing, progressive manufacturers of plating equipment and accessories know and can recommend the correct combination of materials to be installed for a specific application. Never let a plating solution come into contact with a material which has not been tested and found beyond question to be safe!

Solvents from *protective paints* have caused contamination of plating solutions. One case in particular illustrates how a good product can be misused: A manufacturer wished to use a wood tank as a spare treatment tank for his bright nickel solution. He was advised that the unlined wood tank would not be satisfactory, and a high quality phenol-formaldehyde varnish was suggested as a protective coating. He was told to follow the instructions and apply three thin coats, allowing a certain drying time between each coat. Several days later an urgent request was made for service on the nickel solution. It had been pumped into the spare tank, treated, and returned to the plating tank. When plating was started the cathode efficiency was zero, not an atom of nickel could deposit. When the writer looked at the spare tank, the varnish was ⅛ inch thick, soft and gummy whereas it should have been thin and hard. When asked about it, the workman who had applied the lining smiled sweetly and

said, "Yep, I gave 'er a good dose—put it on thick so that it would last awhile. Never do things halfway". He spent until five o'clock the next morning removing the coating with a floor scraper. By applying the thick coating, solvents could not escape readily, and when the hot nickel solution was pumped in the tank, the harmful solvents passed into the nickel bath.

Paint sprays and buffing dusts produced in the vicinity of plating tanks have, in numerous instances, seriously contaminated plating solutions. Plating chemicals may pass all specifications for impurity limits (almost always inorganics only are listed in specifications) and yet contain organic materials which would be ruinous. Recently a sample of nickel salts was submitted for examination prior to acceptance. These salts were of exceptional purity and far above Federal specifications. An electroplating consultant certified that they were the highest quality he had ever analyzed; yet, when a controlled plating test was made, they produced extremely brittle deposits. The organic impurity, as yet unidentified, did not respond even to a permanganate oxidation.

Organic impurities in *organic chemicals* used in electroplating have been troublesome at times. Formaldehyde, for example, is shipped in glass carboys and in paraffin-lined wood barrels. Recently, when trouble was experienced with a shipment of formaldehyde in wood barrels, investigation disclosed that the paraffin lining was imperfect and that the formaldehyde had extracted harmful tannins from the wood.

Another case of contamination involved *activated carbon*. A bright nickel and bright copper solution were treated with activated carbon to remove organic materials that had caused cloudy deposits, but the treated solutions produced deposits that were of poorer quality than before treatment. The trouble was traced to sulfides in the activated carbon originating in the raw material from which it was manufactured.

All *natural organic materials* have a tendency to release organic compounds when in contact with plating solutions. Gums, resins, and tannins are wood extracts and may cause coarsely crystalline and brittle deposits. Some years ago a plater lost a clamp that held the cover on a cylinder used in barrel plating cadmium. A former harness maker, he passed leather straps around the cylinder to hold the cover in place. After a few hours the deposits began to brighten, and finally the cadmium parts sparkled like diamonds. Unfortunately, the brightness could not be controlled; the experiment ended when the leather straps disintegrated. Animals and insects may produce similar effects.

Water was mentioned in a previous section as a source of inorganic contamination. It may also bring undesirable organic material into a plating solution. This possibility is small with artesian wells as a water source, but surface water drawn from cedar swamps and similar sources has a definitely injurious effect on deposits.

Finally, one must consider organic compounds brought into the plating solution on *imperfectly cleaned and rinsed work* or from mechanical equipment around the tank. Buffing compounds caked in recesses, oils from solvent emulsion cleaners that may be carried along the plating line, wetting agents from preliminary cleaners and strikes are all possible sources.

Accessory equipment can bring harmful organic materials into the plating solution. Certain types of packing in pumps and heat exchangers can cause disastrous results. The most pernicious case of contamination of bright nickel solutions ever encountered by the author was caused by a substitute oil packing in a heat exchanger. The packing was not visible, its area in contact with the solution was small, hundreds of similar heat exchangers had given excellent service. One by one, other conditions and materials were checked and finally after some weeks of search it *had* to be the heat exchanger. It was.

Solid and Dispersed Impurities

In discussing solid particle impurities, one naturally thinks first of *dust and dirt* from dust-laden air and of rust, scale and paint from structures external to the tank. Where the air in the plating room is exceptionally

and unavoidably dusty, a high rate of solution filtration must be maintained. On semi- and full-automatic equipment, *grease or oil* may drop from motors, gear boxes, chains, and other moving parts. Some restraint should be used in applying lubricants, and drip pans should be used where necessary. Troubles have been experienced from oil carried with the air into air-agitated solutions. The oil originates at the compressor and is carried along the line to an air filter and oil separator. It pays to use a good air filter and to service it frequently, but it is better practice to use a separate low pressure blower designed to deliver oil-free air for solution agitation.

Slimes and metallic particles are formed on the *anodes* as they corrode. A good anode produces the minimum of loose particles consistent with desirable corrosion characteristics; all soluble anodes, however, produce some sludge. This is not particularly troublesome in unagitated low current density solutions. In hot, high-speed agitated baths for production of heavy deposits, sludge-retaining anode bags must be used to prevent roughness and porosity. Most *chemicals* used in the preparation and maintenance of solutions contain insoluble material. If possible, all chemicals should be dissolved in a spare tank and then pumped through a filter to the main plating baths.

As has been mentioned above in the discussion of soluble impurities, impurities such as *abrasives* and other solid-particle dirt can be brought into the solution from work that has not been properly and thoroughly cleaned. Occasionally, *ground or machined parts* are placed in the plating solution, thoroughly degreased but having loose metallic particles attached. Buffed pieces may have abrasive packed in recesses after degreasing unless a pressure spray is used. One puzzling case involved a necktie holder that, after having been nickel plated, would snag silk ties. The holder was made from a single spline with several spotwelded crossbars, the ends of which were rough after bright nickel plating. At first, the roughness was blamed on the nickel solution, but investigation disclosed that the steel was magnetized and that iron particles were attracted to the points; evidently the assembly had been in a DC field. After demagnetization the difficulties disappeared.

Rust, dirt, and silica are occasionally introduced with make-up *water*. A good line filter will take care of suspended matter in water. Also, the water stream should be allowed to run for a few minutes before directing it into a tank in order to flush sediment out of the line.

Insoluble materials may be formed in solution by *supersaturation*. Several cases have been observed where calcium sulfate brought in with make-up water has reached the saturation point and has crystallized on work being plated, on the surfaces of the plating tank, on immersion heaters or steam coils, and in filter lines. The same phenomenon has been observed in cyanide solutions when the concentration of sodium ferrocyanide reaches saturation. All chemicals normally present in the solution have a solubility limit which, if exceeded, will cause crystallization.

Another source of insoluble matter in a plating solution is the growth of *molds*. This condition has been particularly troublesome in acid copper solutions and is difficult to control once the tank has become infested. Mold growths have been observed in other solutions containing organic brighteners derived from natural products such as gums and sugars.

Many impurities in electroplating baths are neither in true solution nor in a solid or gaseous state but exist as a colloidal dispersion. Colloids or materials which form colloids during electrolysis have been used extensively as *brightening agents*. In normal concentrations these agents may cause increased hardness and stress in the deposits which often show heavy laminations caused by codeposition of the colloid. An excess of the colloid in the bath is usually ruinous to the physical properties of the deposits. Aside from colloids purposely introduced into the bath, there are many impurities which may be carried in or formed in a colloidal state or pass through a colloidal condition due to electrolysis or *p*H change at the electrodes. Anode slimes and many other impurities listed above may exist in

a colloidal form. As an example, cadmium oxide frequently dissolves in cyanide with one of the common inorganic impurities assuming a colloidal condition. When this occurs, it is difficult to produce bright deposits. After standing for months the colloid will gel and precipitate after which the solution will operate satisfactorily. Treatment of the bath with oxidizing agents, aeration, or electrolysis will condition the bath in a much shorter time.

Oil and similar immiscible substances are frequently finely dispersed in plating baths creating a two phase system, usually because of the presence of wetting agents or brighteners having emulsifying properties. Deposits produced from solution contaminated in this manner are non-uniform in appearance, have poor coverage, and may lack adhesion.

Gaseous Impurities

When nickel solutions have been treated with *nickel carbonate* to raise the *p*H for purification treatments, trouble is often experienced after the *p*H has been brought back to normal because carbon dioxide is released under these conditions. The formation of the gas tends to produce brittle deposits because of inclusion of basic $NiCO_3$ or related compounds in the cathode deposit, and the gas itself may cause pitting. Similarly, *dissolved air* released from solutions as they are heated to operating temperatures may cause gas pitting in still solutions if the bath is used immediately. Where this occurs, it is desirable to heat the bath 10° to 20° F above the normal operating point and allow it to cool to the correct temperature before use.

Air may also enter the solution from the *circulating pump;* aspirated through the packing gland, it becomes finely dispersed by the impeller and may cling to work being plated causing pitted areas. Finally, *hydrogen gas* adhering to the cathode may be considered a gaseous impurity. The remedy in this case is to adjust the *p*H and composition of the solution or to use hydrogen peroxide as a depolarizer.

Many sources of impurities have been discussed; there are probably many more. It is rather frightening to have so many presented at one time. The plater may rightly wonder how he has gotten along so many years with these gremlins waiting to dart into the plating bath at every transference of an ion. Fortunately a few simple precautionary measures prevent a great deal of trouble.

Remember, good solutions deserve good treatment!

Papers For A. E. S. Convention 1948

Five educational sessions will be held at the Convention of the American Electroplaters' Society in the Ambassador Hotel, Atlantic City, June 28 to July 1 inclusive.

One of the five sessions will be devoted to reports on A. E. S. Research Projects.

Following the custom of the past few years, it is planned to devote one or two sessions to group papers, all papers at each of these sessions relating to one general subject. Some of the suggested topics under consideration are:

1. Barrel plating
2. Tumbling methods for the preparation of work for plating and for finishing after plating
3. Electropolishing methods in commercial use.

In addition to papers on these special subjects, papers on miscellaneous subjects are solicited.

Prospective authors are urged to submit papers or signify their intentions of doing so at the earliest possible moment so that the committee can plan the program most effectively. All papers must be submitted in triplicate not later than April 1 and abstracts for inclusion in the convention program announcement not later than March 1. In order to plan a well-balanced educational program, the committee urges A. E. S. members, branches, and non-members to take advantage of this opportunity to present their work before the Society.

MYRON B. DIGGIN,
Chairman Educational Committee.

CONTINUOUS ELECTROLYTIC SOLUTION PURIFICATION

C. E. HEUSSER and L. M. MORSE

Chrysler Corporation, Detroit, Michigan

Introduction

While the presence of impurities in plating baths was at one time ignored and later tolerated, bath purity is now recognized as a serious problem which is closely tied in with stress, ductility, and service life of the electroplate.

Chrysler Corporation is one of the larger consumers of electroplated material. For a number of years, its laboratories have tried to keep very careful control of the quality of plating accepted from their various suppliers. On examining and testing plated coatings from many different plants, it has had an unusual opportunity to observe the effects of variations in plating bath conditions including bath purity.

The value of continuous electrolytic bath purification in the production of deposits of uniformly good quality has been repeatedly demonstrated in plants supplying the Chrysler Corporation. This article describes such a method of purification, presents some of the history of its development, and elucidates the principles involved in its use.

Early History

Nickel plating was first practiced on a commercial scale in 1870 when Isaac Adams[1] introduced the nickel ammonium sulfate bath. This bath was used extensively until the early years of this century when it gradually became displaced, first by the single nickel sulfate bath and later by the Watts warm nickel bath. During these years the plating industry was not greatly concerned with the physical qualities of electrodeposits or even with deposit thickness; as long as a coating was thick enough to take a color buffing and adherent enough not to blister or flake, it was considered satisfactory. Quality of deposits was judged mainly by their appearance.

One of the persistent troubles in the operation of these early baths was the appearance of dark, streaked or smutty deposits. This was variously blamed on the acidity or alkalinity of the bath, low metal concentration, poor cleaning, and other variations including impurities in the bath. Since plating baths often were analyzed only once or twice a year for metal concentration and there was no reliable measure of acidity such as we have today, it was hard to fix the major cause of streakiness, etc. However, it was noticed that if the condition persisted after adjustment of the acidity, it could often be cleared up by working the bath—plating a load of scrap or metal sheets. It came to be recognized that the presence of zinc or copper in the bath or in make-up salts was usually responsible It, therefore, became the practice of many platers to "dummy" or electrolyze a contaminated bath or one newly made up. We know now that the success of this method was primarily due to the fact that copper and zinc were removed by co-deposition.

The presence of iron in a nickel bath was not considered harmful. When anodes containing 3 to 7 per cent iron were used most of the iron precipitated as a sludge and caused no apparent difficulty except when the sludge was stirred up and became suspended. Very little iron stayed in solu-

tion at the high operating *p*H. Vuilleumier[2] and others demonstrated the effect of iron in increasing the stress in a nickel deposit. Since the stress increased as the acidity became higher, hydrogen was also blamed for the effect, but it is significant that more iron was held in solution at the higher acidity. M. R. Thompson[3] investigated this subject at the National Bureau of Standards in 1922 and reported that iron in a nickel solution was not detrimental from the standpoint of appearance or adhesion in the *p*H range 5.8 to 6.5 (colorimetric).

When nickel plating was adopted by automobile manufacturers for the finishing of exterior parts, it was soon found that the deposit thicknesses commonly used at that time were inadequate to meet the service demands. This was especially true for bumpers and radiator shells. As a consequence, the plating industry became thickness conscious. During the "twenties" the use of warm solutions of the Watts type became more general and current densities were increased considerably. The use of chromium plating over the nickel necessitated more careful control of the nickel plating operations.

The wider employment of high purity nickel anodes and low *p*H solutions led to the production of a coarser grained deposit and one that was more ductile. The effects of copper, iron, and lead on the average type of work were not a serious problem. When iron had accumulated excessively, it was removed by oxidation with peroxide and precipitation at a *p*H of 5.5 or higher. Contaminating copper was frequently removed by plating on dummy cathodes at low current density, a practice which developed from the earlier method of working out the impurities. The most effective removal of copper was obtained at current densities of from 1 to 3 asf and low *p*H using high temperature and bath agitation. Zinc contamination was often a serious problem in plants plating die castings; removal was somewhat difficult because the *p*H had to be raised to the point where part of the nickel was also precipitated.

As closer studies were made of plating methods and results, it gradually came to be recognized that organic materials in the bath were the cause of much difficulty with brittleness, peeling, and pitting. These organics came from wooden tanks or anode rod supports, soap, grease, sizing on anode bags, etc. Attempts were made to keep these materials out of the bath as well as to remove them periodically by special treatment.

One of these treatments, which also removes zinc and iron, was known as Liscomb's method. It consisted of adsorbing the impurities on a ferric hydroxide gel, produced by adding ferrous sulfate, oxidizing, and raising the *p*H to 6.3 to 6.5, and complete filtration of the bath. Later, other methods were used for removal of organic contamination such as oxidation with permanganate or chlorine and, more recently, adsorption on charcoal and activated carbon.

All of these treatments were necessarily time-consuming. Accordingly, their use was generally relegated to nights, week ends, or inventory periods, except in emergency shutdowns.

When bright nickel became widely accepted, it was soon found that traces of metallic impurities were often the cause of serious difficulties such as loss of brightness, lamination, brittle or cracking deposits, peeling and roughness. Due to the inherently higher hardness and finer grain structure of the bright nickels, it took a relatively smaller amount of these impurities to increase the hardness and stress and consequently the brittleness to a point beyond the range of acceptability. In addition, grayness or dark deposits in the low current density areas were doubly serious since the required buffing defeated the purpose of the bright nickel baths.

Continuous Purification

Because baths for producing bright nickels required more careful maintenance than those used for dull nickel, it became the rule in many plants to insist on purification at fixed intervals. These treatments included one or more of the purification methods mentioned above. Where impurities could be removed by low current density purification or carbon filtration, it was a logical step to make provisions for carrying out such purification on a continuous basis. It was found that this could readily be done

by using a small separate tank in the circulation system. Such units are mentioned in articles by O. A. Stocker,[4] B. C. Case,[5] and M. C. Diggin.[6]

During the past few years and especially since the war, many continuous purification units have been installed in connection with both existing plating tanks and new installations. Reports from the field on these units are very favorable, especially with regard to the high quality of deposits maintained.

It should be emphasized that low current density electrolytic purification is not a cure-all, nor will a continuous electrolytic purification system always eliminate the need for periodic clean-up of the solutions. Users, however, have shown that the interval between batch purifications can be greatly increased and that usually it will not be necessary to raise the *p*H to remove zinc or iron. If the bath becomes contaminated with aluminum, however, high *p*H precipitation will have to be used.

Where the type of bath permits, circulation of the bath through a filter charged with activated carbon is a useful complementary treatment to continuous low current density purification. When metallic and organic impurities are continuously being removed by these two units and when the amounts of impurities are constantly maintained at levels safely below the maximum allowable limits, the quality of plating will be much more uniform and there will be, fewer rejects and less rework loss. Also the problem will seldom arise of deciding whether to shut down a tank in the middle of a week to purify or to take a chance on getting by until the week end.

In order that the maximum benefits from a continuous low current density purification unit be derived, it should be built in accordance with certain design principles which combine both theory and practical experience. It may be helpful at this point to review some of the theory and basic data upon which these principles are founded.

Basic Considerations

There are some plating chemists who take an "I am from Missouri" attitude on the statement that low current density electrolytic purification can efficiently remove iron and zinc contamination from a nickel solution. From the standpoint of the relative position of these metals and nickel in the EMF Series it would be natural to assume that copper and lead would easily be removed because of their lower potentials. Zinc and iron on the other hand, being above nickel in the series, would not be expected to be plated out.

However, the latter prediction is contrary to experience in actual practice. It has been shown by several investigators that iron may be removed rapidly from nickel sulfate solutions by co-deposition

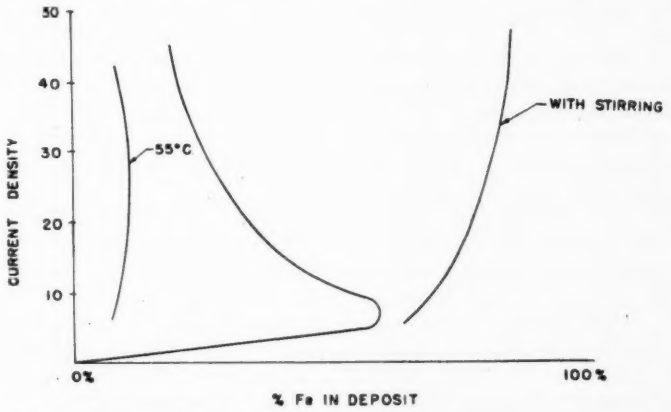

Fig. 1. Examples of effect of current density on iron content of deposits from nickel-iron alloy baths

at a current density around 5 asf. The curves in Fig. 1 cited in Fink and Rohrman's[7] article on the preparation of pure electrolytic nickel shows how the percentage of iron in the deposit varies with the cathode agitation. Other investigators have agreed in that the ratio of iron to nickel in the deposit is nearly always higher than their ratio in the bath.

Likewise, several references appear in the literature on alloy deposition which show that the percentage of zinc in a deposit from a solution of nickel and zinc sulfates is higher than the percentage of zinc in the bath. For example, in a bath with a zinc concentration approximately 4.4 per cent of that of the nickel, there was 58 per cent zinc in the alloy deposited at 4 asf[8].

This apparent switch in the position of these metals in the EMF Series has been ascribed to an effect of iron or zinc on the cathode polarization of nickel which raises the deposition voltage above that of iron or zinc[9].

The efficiency with which these metals are removed from a nickel solution is always greatly improved by rapid cathode agitation.

Copper and lead are very easily removed by deposition at low current densities. The efficiency of removal of copper from an agitated solution containing only 10 ppm of copper is nearly 100 per cent at 3 asf. Without agitation the efficiency drops and some nickel is deposited because the solution next to the cathode becomes rapidly exhausted of copper. When that happens, nickel will be deposited until more of the contaminated solution is brought to the cathode surface. The natural convection movement of the solution is usually not rapid enough to keep up with the rate at which the copper is plated out of the cathode film, and agitation is added to accelerate the rate at which fresh solution is brought into contact whith the cathode.

Ordinarily not much lead can be kept in solution in a nickel sulfate bath because of the low solubility of lead sulfate. However, when the nickel chloride concentration is around 12 oz/gal or higher or when certain organic acids are present, the solubility of lead becomes a problem.

Data in the Chrysler Corporation's files show that lead can be removed rapidly; a nickel plating solution containing 75 ppm of lead, for example, gave approximately 15 per cent lead in a dummy cathode deposit produced at 3 asf with no agitation.

Although no instance has been noted in the literature, field reports have indicated that chromium contamination may be removed electrochemically from a nickel bath if the chromium has first been reduced to the trivalent form.

Weisberg[10] states that some organic impurities can be removed by codeposition with nickel at 3 asf while others require a much higher current density for their removal.

From its position in the EMF Series aluminum would not be expected to be removed by co-deposition because of the extreme difference in electrode potential.

No convenient changes in polarization seem to help us here, experiment having confirmed absence of removal.

To summarize, zinc and iron as well as copper and lead may be co-deposited with nickel from nickel solutions containing quite small amounts of these impurities. In every case strong agitation of the electrolytes or the cathode greatly increases the percentage of impurity in the deposit and, therefore, the efficiency of its removal. There is also reason to believe that the method could be adapted to the removal of chromium.

These principles are put in practice simply by providing a set of anodes and auxiliary cathodes, past or around which the plating bath is being continuously circulated while the cathodes are being plated at a current density of from 1 to 5 asf.

Design Data

There is considerable room for debate concerning the proper arrangement of the purification unit in the circulation system. It is the opinion of the writers that some arrangement similar to the one shown in Figs. 2 and 3 will work well in the majority of cases. Here the electrolytic purification unit is placed ahead of the filter and the heat exchanger. A space for chemical additions

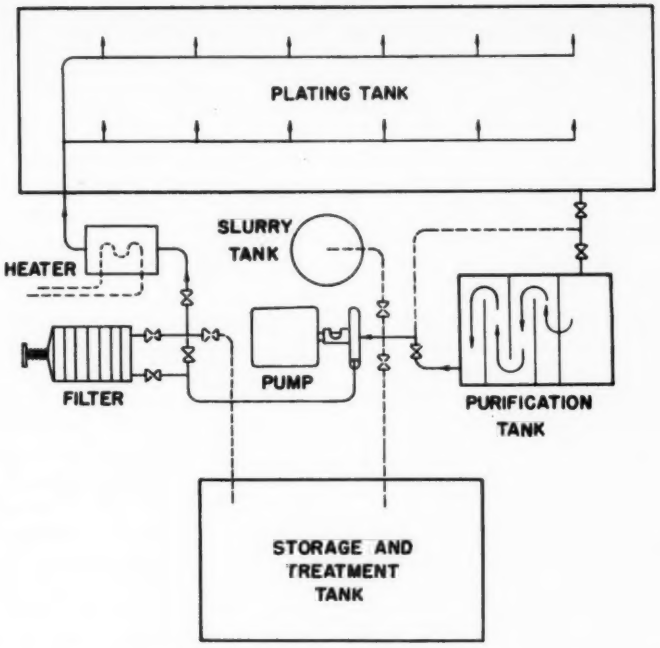

Fig. 2. Schematic diagram of filtration-purification unit

is provided at the intake end of the purification tank in order that added salts be subjected to some purification before the solution reaches the plating tank. In addition, should there be a tendency for the deposition of loose particles on the cathodes, they will if dislodged be removed by the filter before the circulated solution is returned to the plating tank.

Provision should be made for by-passing the purification unit when desired so that it will not interfere with pumping of the bath directly to a storage or treatment tank.

The anode-to-cathode distance should be as close as it is practicable to build in order to insure a high rate of flow past the cathodes. Cathodes of corrugated or expanded metal are better than flat sheet cathodes; they not only make the purification less selective by providing a range of current densities but also break up the solution flow to produce turbulence. One operator who uses a cathode made of slats, looking somewhat like a venetian blind, reports this type to be the most efficient one he has tried.

While the minimum size of a purification unit is governed by such factors as drag-in, condition of plating racks, shape and composition of parts being plated, and tolerance of the plating bath to specific impurities, certain *experience* guide posts have become recognized factors in design. They are based mainly on the size of the main plating tank. Four important ones are:

1. Allow 5 amperes in the auxiliary tank for each 100 gallons of plating bath

2. Allow 1 square foot of dummy cathode area for each 100 gallons of plating bath

3. Make provisions for circulation of ¼ to ⅓ or more of the total volume of the plating bath per hour of operation

4. Design to have this volume produce a minimum flow rate of 6 feet per minute past the cathodes.

These factors will give a unit which will be more than adequate to cope with average contamination.

In the interest of economy every reasonable step should be taken to reduce the amounts of impurities introduced into the bath. When this is done, the current requirements for purification may be reduced to 2 amperes or even 1 ampere per 100 gallons. When reducing the current to the auxiliary tank, the cathode area must also be reduced to provide the proper current density because too low a current density in some cases will give inefficient separation. This is the case, for example, with separation of iron.

Reducing the purification current from 500 to 100 amperes makes possible a substantial saving in nickel anodes. Of course, this saving would be false economy if it were made at the risk of running rejects. Hence any steps in the direction of decreasing the rate of purification must be taken slowly and cautiously.

Another means of increasing the effectiveness of a purification unit where the type of solution will permit is the judicious use of air agitation in the auxiliary tank. The cost of operating the air agitation will be more than offset by the savings in nickel.

As a specific *example* of the use of these principles in the layout of an actual purification system let us use a 10,000 gallon nickel tank.

The cathode area in the purification tank should be 0.01 x 10,000 = 100 square feet. By using a grade of corrugated metal for cathodes, about 37.5 square feet of this metal will provide the necessary area since both sides are plated and additional plating area will be provided by the corrugations. If the purification tank is made three feet deep, the vertical dimension of the cathodes may be 2½ feet; 37½ divided by 2½ gives 15 linear feet of cathode bar.

In order to get the maximum rate of solution flow past the cathodes, the circulated solution should be made to travel the entire 15 feet of the cathode area. This could be accomplished by making the tank long and narrow with one row of cathodes 15 feet long, but it will usually be more convenient to make a shorter, wider tank with several cathode bars and with baffles to direct the solution past each row of cathodes.

Assume that a pump and filter unit is available which is capable of delivering 3000 gallons per hour of sustained flow. If we make the depth of the solution 2¾ feet and we want to get a flow rate of 6 feet per minute through

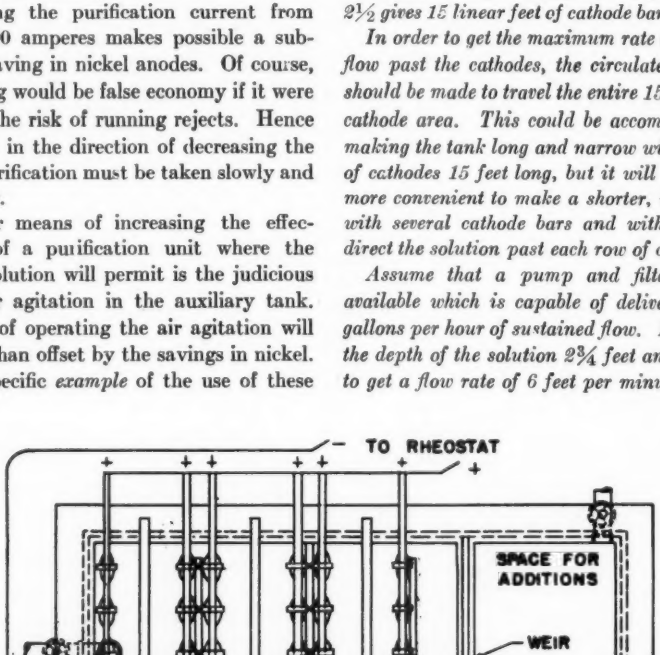

Fig. 3. Section and plan view of a purification tank

the tank, we calculate the distance between rows of anodes as follows:

3000 gallons per hour = 400 cubic feet per hour = 6.7 cubic feet per minute.

This much flow through a path of 1 square foot cross section would give a speed of 6.7 feet per minute. For a speed of 6.0 feet per minute the required cross section would be 6.7/6.0 or approximately 1.1 sq. ft. With a solution depth of 2.75 feet the width of the path will be 1.1/2.75 = 0.40 feet = 4.8 inches which is the distance to be allowed between anode surfaces. If the inside surfaces of the anodes are 4.8 inches apart, the anode bars will be approximately 6 inches apart and the baffles or tank walls about 7½ inches apart. This spacing is rather close, but for wider spacing the tank must be made more shallow to keep the cross section at 1.1 square feet or less.

Because permanent baffles in the tank would make rubber covering very difficult, removable baffles are recommended, held in position with slots or lugs on the sides and bottom of the tank. Baffles may be sheets of hard rubber, wire-reinforced glass, or rubber covered steel.

More Information Needed

Many readers may be now using equipment of this type and undoubtedly are finding ways to improve upon its design and operation. As with any other method in the development stage, there are many things yet to be learned about the use and application of electrolytic purification. The research programs of the American Electroplaters' Society will undoubtedly provide answers to many questions such as: What are the effects of bath impurities on hardness, grain size, and stress in bright and semi-bright nickel deposits? What is the relationship between stress in the desposit and outdoor exposure life? In this latter connection, because the relationship between stress and corrosion has been repeatedly demonstrated with other metals, there is reason to believe that stress in nickel deposits may have an effect on corrosion rate even if visible cracking does not ocur.

Meantime, we will have to be satisfied with the knowledge that the baths which are kept in top notch condition by continuous purification are giving less difficulty with hard, brittle nickel deposits and are saving many hours of extra work in buffing and in frequent general bath purifications.

Acknowledgement

The authors wish to acknowledge the very material assistance with the preparation of this article which has been so kindly provided by Standard Steel Spring Company, Motor Products Corporation, Gordon Manufacturing Company, Kuehne Manufacturing Company, Eaton Manufacturing Company, Company, Doehler-Jarvis Corporation, and Hanson-Van Winkle-Munning Company.

They also wish to express appreciation to the Chrysler Corporation for permission to publish.

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INDUSTRIAL HOUSEKEEPING & SANITATION

By JOHN C. SOET

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From the *Proceedings of the Inservice Training Course on Environmental Controls for Industrial Processes* given by the SCHOOL OF PUBLIC HEALTH, University of Michigan, October 2–4, 1945. Reprinted with the kind permission of the School.

The subject of industrial housekeeping and sanitation practically covers the entire field of industrial health or hygiene. It is difficult in a short article to select the material which will be of most value in plant maintenance work. One cannot have good housekeeping and sanitation without a good industrial exhaust system. One cannot have good industrial housekeeping and sanitation without a good plant layout. One cannot have a good industrial housekeeping and sanitation program without controlling the hazards associated with industrial solvents or painting. In fact, any subject that one may select from the field of industrial health or hygiene has a bearing on good housekeeping and sanitation in plants.

I believe the value of good housekeeping and sanitation was well expressed by Eric Johnston, president of the U. S. Chamber of Commerce, in the book, *Report on the Russians*, by William L. White. White and Johnston were making a tour of Russian industrial plants about two or three years ago and on one occasion, Johnston turned to White and said, "Back in the States the best rough test I know of the efficiency of a factory is its cleanliness. A dirty shop is sure to be an inefficient one."

In addition to the efficiency and economy of operation mentioned by Johnston, there are many other benefits to be derived from a good housekeeping and sanitation program in factories. Most of these benefits, however, can be classified under two headings. The first is that good housekeeping and sanitation promotes good relations between management and labor and second, it prevents and reduces the harmful effects of industrial hazards and communicable diseases which cause excessive absenteeism.

I have never seen a company having poor housekeeping and sanitation in its plant on the one hand and good relations between management and labor on the other. I could cite several examples where bad factory conditions have resulted in a great deal of friction between management and labor. The reduction of harmful effects of industrial hazards and communicable diseases through good housekeeping and sanitation has become axiomatic in American industry and requires no additional evidence.

However, this article is not to deal with justification. I shall confine it to three principal factors: first, general principles and methods for achieving good housekeeping and sanitation in industrial plants; second, industrial illumination; third, industrial sanitation or personal service conveniences.

Organization and Methods

The first step in achieving good housekeeping and sanitation in industrial plants is to establish a GOOD ORGANIZATION for

doing the work. A definite scheme of operation must be adopted and maintained. One cannot hope to keep a factory in good condition with haphazard cleaning and maintenance schedules. One cannot hope to do good work when maintenance and cleaning work is done only when the time or personnel is available. Good plant housekeeping and sanitation is similar to public health. It's a matter of prevention and not cure. It requires a continuous and untiring effort to prevent the plant from deteriorating to the point where it becomes a major operation to get it back in good condition.

The next item is SUPERVISION. It matters little which division of the plant is responsible for the housekeeping and sanitation. It may be the engineering division or the maintenance division. Perhaps the maintenance division is under the engineering division and the ultimate responsibility is in the engineering department. The point is, some one division and some one head of the division should be responsible for the condition of the plant. Of course, some of this responsibility should be passed down to the foreman and the workers themselves. The foreman should be held responsible for the condition of his department either in whole or in part and he, in turn, should hold the worker responsible for keeping his working area at a high standard of cleanliness.

Many methods have been devised for encouraging each department to maintain a high standard of housekeeping and sanitation. Often the injection of some COMPETITIVE SPIRIT has proved valuable. In several plants the departments are scored every week as to their condition and the score is posted on large bulletin boards. The right time to educate the workers in their responsibility to maintain their work areas clean is at the time of hiring. One cannot expect cooperation from a worker who is allowed to work for six months before he is told to keep his working areas at a high standard of efficiency and cleanliness.

The third item in the general program is an ADEQUATE BUDGET. Keeping a plant up to a high standard is not a minor item as far as cost is concerned. While the cost of good housekeeping and sanitation may vary from plant to plant depending upon the type of material produced, it is an appreciable percentage of the total cost of producing a product. We often hear complaints from plant engineering or maintenance departments that their budget is not adequate to do a good job. Since it is non-productive work, it always suffers in comparison to the other departments or divisions who work on production alone. Without an adequate budget one cannot provide the personnel, machines, and equipment necessary to do the job. An inadequate budget for housekeeping and sanitation will inevitably be reflected in the quality of workmanship and the quantity of material produced.

The fourth item to consider under the heading of general principles, is PLANT LAYOUT. The re-conversion period is an excellent time to give thought to this problem. No doubt, most plants are rearranging machines, equipment, and production lines. These should be arranged with a view to maintain good housekeeping and sanitation as well as production. Fortunately, in most cases, the machine layout which is conducive to high production is usually the layout which is conducive to good housekeeping and sanitation as well.

This brings us to the problem of overcrowding. Overcrowding of men and machines is neither conductive to efficiency nor to good housekeeping or sanitation. During the war, overcrowding appeared to be a necessary evil since the last increment of production was imperative, regardless of cost. No doubt, this overcrowded condition will be mitigated in the post-war period.

The fifth item is the MECHANICAL MEANS. The contaminating operations must be controlled to achieve good housekeeping. Efficient control of contaminating operations not only reduces the health hazards and decreases deterioration of the physical assets of the plant but is a major step in keeping the plant clean. These contaminating operations can be kept safe through: (1) proper and adequate exhaust ventilation, either local or general (local ventilation preferred); (2) segregation and enclosure; (3) substitution of non-toxic material for hazardous material. It should be pointed

out that even when certain operations are segregated and enclosed, they may still require exhaust ventilation. Substitution is not always practical and the old saying that no matter how toxic the material, there is a way it can be handled safely, holds good, providing one knows something about the toxicity and other physical and chemical characteristics of the substance.

TABLE I

MAXIMUM PERMISSIBLE CONCENTRATION OF ATMOSPHERIC CONTAMINANTS

Dusts	Mpcf*
Asbestos	5
Mica	50
Nuisance (no free SiO_2)	50
Silica—high (above 50% SiO_2)	5
Silica—medium (5 to 50% SiO_2)	20
Silica—low (below 5% SiO_2)	50
Slate	50
Soapstone	50
Talc	50
Total dust (below 5% SiO_2)	50

*Million particles per cubic foot of air, standard lightfield count.

In controlling contaminating materials it is necessary to bring them not only under visible control but below concentrations hazardous to the workers. The importance and necessity of good control methods can be shown by the following illustrations. Table I is a table of MAXIMUM ALLOWABLE CONCENTRATIONS for dusts. Concentrations cannot exceed the amounts shown in this table without injury to workers on continued exposure. The limits are given in million particles per cubic foot of air breathed. To most, these figures mean very little since the quantities of dust are not expressed in terms which are familiar in everyday work.

Figure 1 presents a visual picture of what these maximum allowable concentrations mean. The small cubes with solid lines represent the quantities of allowable dust concentrations. The large cube with dotted lines represents one cubic inch. One can readily see that control equipment must do a good job to keep dust concentrations down to these small amounts.

TABLE II

MAXIMUM PERMISSIBLE CONCENTRATION OF ATMOSPHERIC CONTAMINANTS

Heavy Metals	Computed as:	mg/10m³*
Cadmium	Cd	1
Chromic acid	CrO_3	1
Fluorides	F	25
Iron oxide fume	Fe_2O_3	150
Lead	Pb	1.5
Magnesium oxide fume	MgO	150
Manganese	Mn	60
Mercury	Hg	1
Zinc oxide fume	ZnO	150

*Milligrams per ten cubic meters of air.

Table II gives the maximum allowable concentrations for heavy metals. Since 10 cubic meters is the approximate quantity of air breathed by an adult over an eight-hour

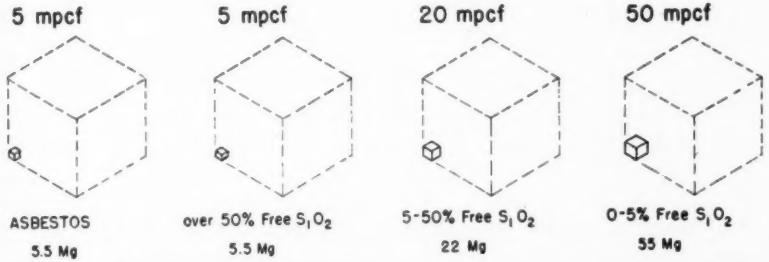

Fig. . Maximum allowable concentration (M. A. C.) of dust in millions of particles per cubic foot. The amount of material in mg if dispersed in one cubic foot of air as particles 1–3 microns in size would be 100 times the M. A. C. Approximately 3½ times this amount would equal the M. A. C. if dispersed in 10 cubic meters of air

period, the allowable weights of heavy metals are expressed in milligrams per this volume of air. In Figure 2 are compared the allowable concentrations with one cubic inch, again represented by the large cube with dotted lines.

The same procedure is shown for liquids in Table III and Figure 3, only that in the case of liquids the allowable concentrations are compared to one-half pint which is represented by a circle. The allowable concentrations are shown as black areas in the circle. These illustrations should give concentrations are shown as black areas in the circle. These illustrations should give an idea of the absolute need for efficient and adequate control equipment to capture and carry away contaminating material to the point where remaining concentrations are less than the quantities shown.

There are other things to consider in maintaining a clean factory which are quite evident and obvious, such as GENERAL PAINTING AND CLEANING. Many plants are in a condition which appears practically beyond the point of rehabilitation as far as housekeeping and sanitation are concerned. It is surprising, however, what can be done to improve them. I recently saw a striking and practical illustration of this. The management informed me it was going to institute a campaign to bring its plant up to a high standard of housekeeping and sanitation. On the surface, the job appeared an impossible one. On my return a few months later, I was surprised to find that they had done an excellent job of raising their plant to a reasonably high standard. It was done by cleaning and moving all unnecessary material out of the production areas. Machines were rearranged; windows were cleaned; concrete floors were installed; the walls and ceilings as well as the machinery were painted. This plant can now be classified as one of the better foundries in the State of Michigan.

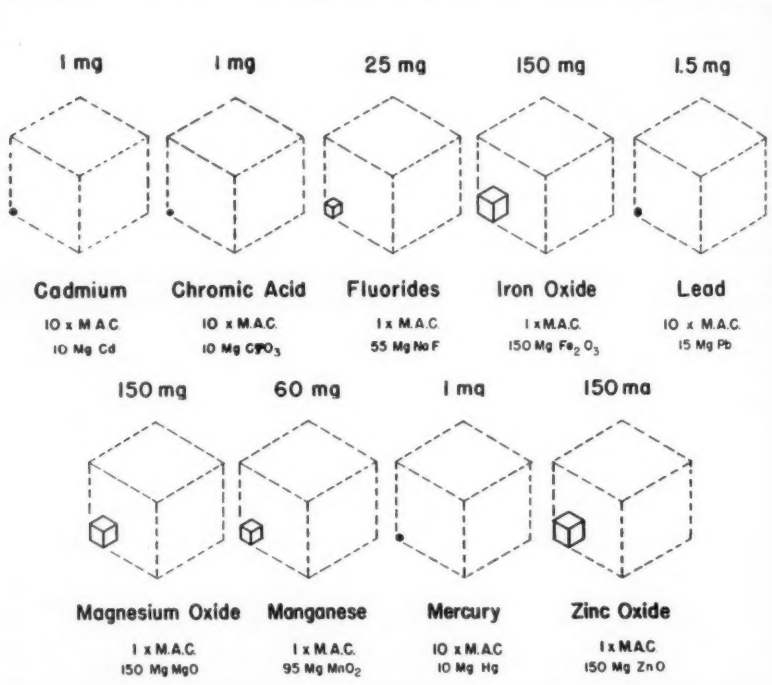

Fig. 2. Maximum allowable concentration (M. A. C.) of heavy metals in mg per 10 cubic meters of air. The figures in the last two lines under each cube are based on dispersion of the material as 0.1 to 1.0 micron particles of fume or dust

Finally there are some factors that actually have very little to do with the production operations in the plant itself, but are an important influence in maintaining good housekeeping and sanitation standards. One of these is a GOOD MEDICAL DEPARTMENT, one which can set the tone or feeling for the whole plant.

In one particular company's plant, the medical department was used as the focal point in the rehabilitation program. Plans were drawn for a new medical department in order that good housekeeping and sanitation procedures could be followed. After the new medical department was built and operating, one could notice a decided change for the better in the morale of the men and in the housekeeping and sanitation in the production area of the plant itself. We have seen this work out not only in large plants but in small plants with a one-room dispensary employing a part-time nurse.

Illumination

The second major factor which requires discussion is illumination. The employer can do much to improve the quality of the product he manufactures by providing all the facilities possible to raise the employee's eye skill to the maximum efficiency. Every employee comes to the employer with three skills: First, the worker comes with a hand skill. The employer can in a minor degree improve or train that skill but, in the main, the worker either has hand skill or he does not have it. Second, he comes with a mental skill. The same thing applies here: he either has or does not have it. Third, he comes with an eye skill, and here is where the employer can do much to improve the worker's skill. He can have the employee examined and recommendations can be made by the plant physician for corrective glasses, and the employer can provide

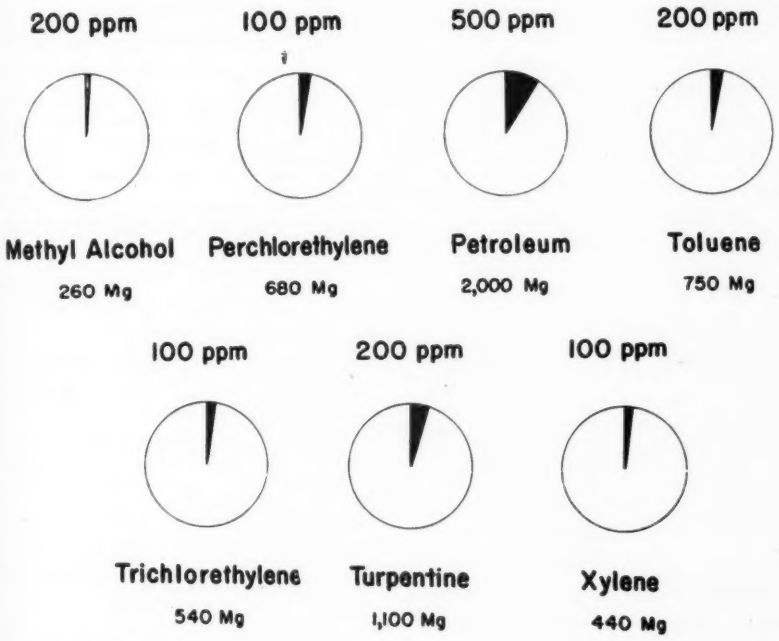

Fig. 3. Maximum allowable concentration (M. A. C.) of liquids in parts per million parts of air. The mg values if dispersed in 10 cubic meters of air would equal 1/10 of the M. A. C.

TABLE III

MAXIMUM PERMISSIBLE CONCENTRATION OF ATMOSPHERIC CONTAMINANTS

Gases and Vapors	ppm*
Acetone	1000
Acrolein	1
Aliphatic acetates	500
Ammonia	100
Benzene	75
Bromine	1
Carbon dioxide	5000
Carbon disulfide	20
Carbon monoxide	100
Carbon tetrachloride	50
Chlorine	1
Ether	500
Ethylene dichloride	100
Formaldehyde	10
Hydrochloric acid	10
Hydrocyanic acid	20
Hydrofluoric acid	3
Hydrogen sulfide	20
Methyl alcohol (methanol)	200
Nitrogen oxides	25
Perchlorethylene	100
Petroleum vapors	500
Phosgene	1
Sulfur dioxide	10
Toluene	200
Trichlorethylene	100
Turpentine	200
Zylene	100

*Parts per million parts of air by volume.

adequate illumination to raise the worker's eye skill to a high level of efficiency.

While all may be unconsciously aware of the advantages of good illumination, I believe that it would be advantageous to review some of the more IMPORTANT BENEFITS. Through good lighting one can obtain: (1) greater accuracy of workmanship, (2) increased production and decreased costs, (3) better utilization of floor space, (4) a greater ease of seeing, especially important for older employees, (5) a more easily maintained cleanliness and neatness in the plant, and (6) better supervision.

While the discussion of a comprehensive illumination program in the factory is a job for a competent illuminating engineer, all should have a knowledge of the fundamental principles involved in good lighting and lighting facilities.

There are two general factors to be considered in good lighting. The first is quality of light and the second is quantity of light. QUALITY OF LIGHT includes the direction and diffusion of light, glare and color of light. While some shadow effects may be desirable for accentuating the depth and form of solid objects, harsh shadows should be avoided. Diffusion units having a wide distribution of light make shadows softer and less pronounced. Alternate light and dark areas resulting from local light in small work areas are, therefore, unsatisfactory unless the general room area is sufficiently illuminated. Care should be exercised that contrast between local illumination and general illumination be not too great. The ratio should not exceed 10 to 1 and a ratio of 5 to 1 is preferable.

We recently had an excellent illustration of this important principle. The workers in a small tool grinding plant insisted on having a powerful source of light concentrated on their grinding wheels, with the surrounding plant area darkened. The windows in the plant were covered with paper and later painted to shut off the general illumination. The operation consisted in taking a tool from a rack located in the dark area, grinding the tool under a high illuminated area at the wheel and then placing the tool back into the rack in the darkened area. In other words, the worker's vision was continuously passing through a high contrast area. In a few weeks, all the workers complained of nausea and headache. These workers were finally convinced that their ill health was due to their insistence on having a powerful light source directly on their grinding area and the balance of the plant darkened, and that the sharp contrast between the bright and the darkened areas was not only a detriment to their well-being but resulted in inferior workmanship in their grinding operations. After the situation was corrected, no more complaints were made by the workers and the quality of workmanship was materially improved.

Glare is one of the most common faults in illumination. There are two kinds of glare—"direct" and "reflected." Direct glare is caused by unshielded lamps or highly bright surfaces. To avoid direct glare from arti-

ficial light, fixtures should be above the normal line of vision and so designed that the light will not be emitted in the horizontal plane. Reflected glare is self-explanatory. It is caused by such things as highly polished machine surfaces, glossy walls, table tops, etc. Reflected glare can be more annoying than direct glare because it is always in the line of vision and the eye cannot avoid it.

Except in matching operations, color quality of light has little effect on clearness and speed of seeing provided there is an equal amount of illumination. The COLOR OF THE SURROUNDINGS, however, is an important factor in illumination. All know the value of light-colored surfaces to brighten up plant interiors. Light-colored backgrounds help to reduce the contrast effected by windows and artificial light sources. There is a distinct advantage to painting the machinery with light-tinted paints. There is also benefit from painting stationary and moving parts of a machine in different colors to aid perception and thus reduce accident s

The QUANTITY OF LIGHT required for industrial operations depends upon the operation itself or the degree of seeing accuracy necessary in the operation. Tables have been prepared by illuminating engineers which show the amount of light necessary for practically all types of work. It may vary all the way from 10 foot candles to 1000 foot candles depending upon the type of operation.

There is more to good lighting than the installation of good lighting facilities. Facilities and arrangements soon deteriorate without PROPER MAINTENANCE. Maintenance in itself is a great help in providing the adequate quantity of light. Too often lighting facilities are installed and then forgotten. Periodic checks should be made to insure efficiency of operation. The amount of light can often be increased without additional consumption of power by cleaning or replacing old reflectors. Dirty walls, floors, and ceilings can account for as high as 25 per cent loss in the quantity of light. Figure 4 illustrates the loss of light through improper maintenance.

Sanitation

The third major factor is personal service conveniences. Proper and adequate sanitary facilities in an industrial establishment are the result of suitable equipment plus a good maintenance program. The advantages of providing the required type and amount of sanitary conveniences adequately maintained are so evident that they require no detailed explanation. It should be sufficient to point out that cleanliness does much to set the general tone or feeling in the plant and thus motivates the employee to do a better job. When the employee works in a poorly maintained shop, he consciously or unconsciously assumes that his employer

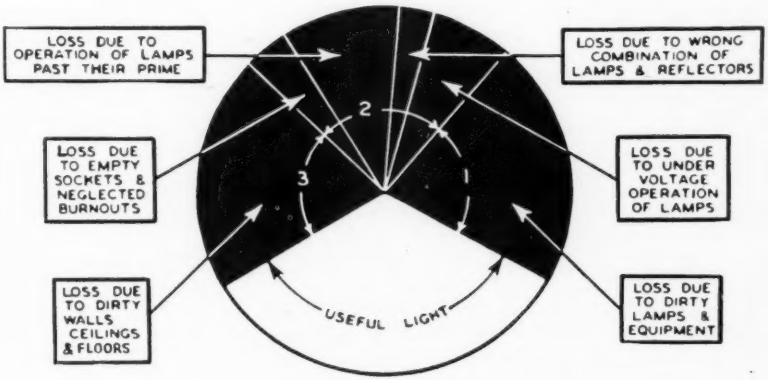
LOSS DUE TO OPERATION OF LAMPS PAST THEIR PRIME
LOSS DUE TO WRONG COMBINATION OF LAMPS & REFLECTORS
LOSS DUE TO EMPTY SOCKETS & NEGLECTED BURNOUTS
LOSS DUE TO UNDER VOLTAGE OPERATION OF LAMPS
LOSS DUE TO DIRTY WALLS CEILINGS & FLOORS
LOSS DUE TO DIRTY LAMPS & EQUIPMENT
USEFUL LIGHT
1
2
3

Fig. 4. Loss of light through improper maintenance

will accept inefficient and slovenly work.

The maximum benefit from adequate sanitary facilities properly maintained cannot be achieved without the cooperation of the employees which implies education and supervision of the employees. It is important that the workers are brought to feel that good sanitary conveniences in their work place require a responsibility on their part to help maintain these facilities in proper condition.

The correct method of approach to this important industrial problem is first, provide the necessary equipment; second, arrange for proper maintenance of that equipment; and third, educate the workers to take advantage of and cooperate with management in maintaining the equipment.

The majority of industrial plants have two SOURCES OF WATER SUPPLY—a municipal supply and an industrial supply. The water for industrial purposes is usually obtained from wells, lakes, or streams. If possible, the industrial water supply and the municipal supply should be in two separate piping systems with no connections between them. Such connections are known as cross connections and are illegal in many localities. When the municipal supply or otherwise approved water supply is used for process purposes, the supply pipe should always terminate in such a location that it discharges through air and cannot be submerged. If equipment demands a connection below water level, a VACUUM BREAKER should be installed.

Figure 5 illustrates what is meant by a

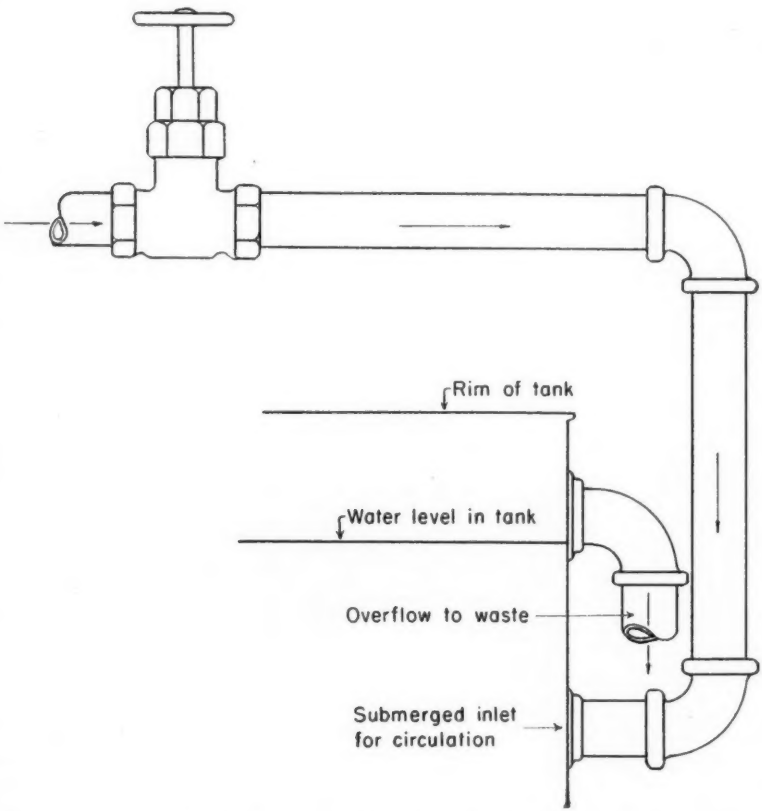

Fig. 5. Improper connection of municipal water supply

cross connection. It will be noted that the water enters the tank below the overflow. In the event that a back-siphonage occurs in the water line, water will be drawn out of the tank into the general piping system of the plant. We have recently found many of these installations on cyanide cleaning tanks.

In Figure 6 the piping installation to the same tank has been installed so that in the event of back-siphonage, no water can be drawn from the tank into the general piping system of the plant. Note the position of the check valves in the supply line. Check valve A allows water to flow into the tank only. When water flows through check valve A, check valve B closes. As soon as a back-siphonage occurs, check valve A closes. In the event that check valve A fails to close completely, check valve B will open allowing air to enter the line instead of water from the tank.

This installation is recommended *only* in cases where an air gap cannot be obtained between the water inlet and the top of the tank which the line supplies. It is useful on large size lines for which gravity operated vacuum breakers cannot readily be obtained.

It is the responsibility of plant management to supply clean, cool, and safe DRINKING WATER approved by the state or local health authorities. If the plant should be located in an area where a municipal water supply is not available, local or state health department should examine and approve the water supply. The temperature of water for

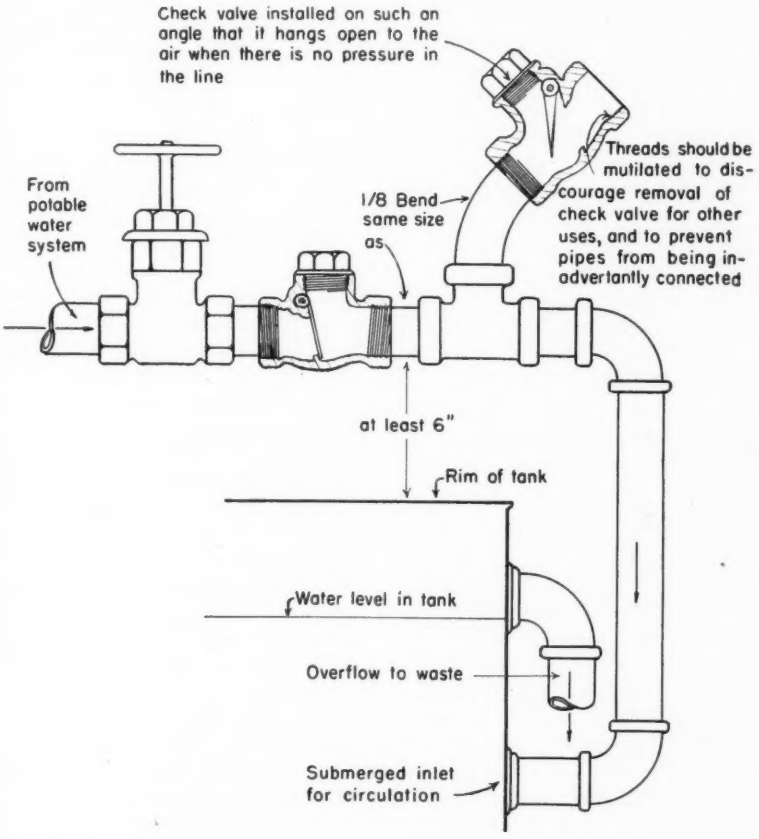
Check valve installed on such an angle that it hangs open to the air when there is no pressure in the line
From potable water system
1/8 Bend same size as
Threads should be mutilated to discourage removal of check valve for other uses, and to prevent pipes from being inadvertantly connected
at least 6"
Rim of tank
Water level in tank
Overflow to waste
Submerged inlet for circulation

Fig. . Proper connection of municipal water supply

drinking purposes should not exceed 80° F., nor should it be lower than 40° F. Somewhere between 40° F. and 50° F. is preferred. Open containers for water and the common cup or dipper are not approved. When drinking fountains are provided, they should be constructed of impervious material with the jet set at an angle from the vertical and above the edge of the bowl. The bowl of the fountain should be so designed and proportioned as to be free from corners which would be difficult to clean. There should be at least one drinking fountain conveniently located for every 50 employees.

TABLE IV

TOILET FACILITIES RECOMMENDED

Number of Persons	Minimum Number of Facilities
1 to 10	1
10 to 24	2
25 to 49	3
50 to 100	5
100 or over	1 for every additional 25 persons

Every year we get many requests from industry for the number of TOILET FACILITIES that should be provided. Table IV may be of value in this connection.

Whenever urinals are provided, one urinal may be substituted for one toilet, provided the number of toilets be not reduced to less than 2/3 the number shown in the table.

In new installations, the minimum floor space allotted for toilet facilities, lavatories, and urinals should be as shown in Table V.

TABLE V

SPACE ALLOTMENT FOR TOILET FACILITIES

	Minimum Width in.	Minimum Depth ft.	Minimum Total Floor Space sq. ft.
Toilets	32	3½	16
Lavatories	24	3½	12
Urinals	24	3½	12

Other items to be considered in providing adequate toilet facilities include heating, ventilation, and illumination of toilet rooms. Daily cleaning, servicing, and maintenance of these facilities are imperative.

Adequate WASHING FACILITIES are important items in all plant programs; however, there are some industries in which the adequacy of washing facilities is *extremely* important, namely those in which workers are exposed to excessive heat, skin irritants, or dusty and dirty operations.

In the provision of proper and adequate washing facilities, at least one lavatory with hot and cold running water should be provided for every 10 employees up to 100; over 100, one lavatory for each additional 15 employees. In the event that workers are exposed to toxic materials or materials causing skin irritations, one wash basin with hot and cold water should be provided for every 5 employees and, in addition, wash basins should be located in places conveniently accessible to the workers. In those same industries, showers should also be provided with hot and cold water. In general, one shower for every 15 workers is sufficient. The amount of sink space necessary is usually considered to be about 24 inches for each worker. However, we have found in the case of circular or semicircular wash fountains that 18 inches of sink is adequate.

DRESSING ROOMS or change rooms with lockers are imperative in places of employment in which the work performed involves exposure to excessive dust, dirt, heat, moisture, or toxic and irritating materials. When work clothes are exposed to toxic or irritating materials, two-compartment lockers should be provided; that is, one compartment for the work clothes and the other for the street clothes. An important factor in lockers is adequate ventilation. There are times when natural ventilation is not sufficient. Then some means of forced ventilation should be employed in the locker rooms or through the lockers in order to dry the clothes sufficiently for the following day's work.

Work places which employ 10 or more women should furnish a REST ROOM or retiring room. In the event that less than 10 women are employed, an equivalent space, properly enclosed, should be set aside. A minimum space of 60 square feet should be allotted to a retiring room for 10 women,

and 2 additional square feet should be added for each additional woman. Where 10 or more women are employed, a couch or bed should be provided. Standards have been set up for the number of beds necessary, as shown in Table VI.

TABLE VI

BEDS FOR FEMALE EMPLOYEES

No. of Women Employed	No. of Beds
10 to 100	1
100 to 250	2
Over 250	1 additional bed for each 250 additional women

There has been an increasing amount of interest in industrial CAFETERIAS in recent years, apparently stimulated by the war. There is, however, some question in the minds of industrial management as to the amount of space which should be given to lunch rooms and cafeterias. The areas that should be provided according to the American Standards Association are given in Table VII.

TABLE VII

LUNCHROOM AREAS RECOMMENDED

Persons	Sq. Ft. Per Person
Less than 25	8
25 to 74	7
75 to 149	6
150 to 499	5
500 or more	4

Industrial Hygiene Services Available to Industry

Operations involving the use of volatile solvents, unless properly controlled, may expose workers to health hazards. Governmental industrial hygiene agencies in almost every State can assist plant managers in making the solvent department and other potentially hazardous departments safe places to work. The service, available at no cost from these agencies, is likely to be particularly helpful to small plants which have no safety or industrial hygiene departments of their own. Consultation on the department layout, equipment and operation is avilable from these agencies. Also, workmen sometimes develop symptoms of occupational illness when there is no obvious source of trouble in the working environment. In such instances, engineers and physicians from the industrial hygiene service can help to detect and correct the cause.

The *Industrial Hygiene Division of the U. S. Public Health Service*, which has its headquarters in Washington, D. C., is the national agency responsible for the protection of workers' health. Consultants representing the Division are stationed in Public Health Service District Offices throughout the country. Direct service to industry is rendered by State bureaus of industrial hygiene, which are located in State departments of health except in Massachusetts and New York, where they are part of the Labor Department. A number of cities also have municipal industrial hygiene divisions.

Typical services offered include:

Chemical—Analysis of the solvent to determine its composition (where this is not indicated on the container). Analysis of the workroom air to determine whether the air is being kept sufficiently safe.

Engineering—Survey of engineering controls; consultation on the design or improvement of ventilating systems and on personal protective clothing and respirators.

Medical—Survey to determine whether workers show signs of exposure to solvents or other toxic materials; assistance in setting up a medical and nursing service suitable for the size of plant involved; assistance in planning an effective health program with adequate records.

Educational—Lecturers who will advise workers and management on such matters as the safe methods of handling solvents and the use of safety equipment. Literature for both plant management and workers is frequently available.

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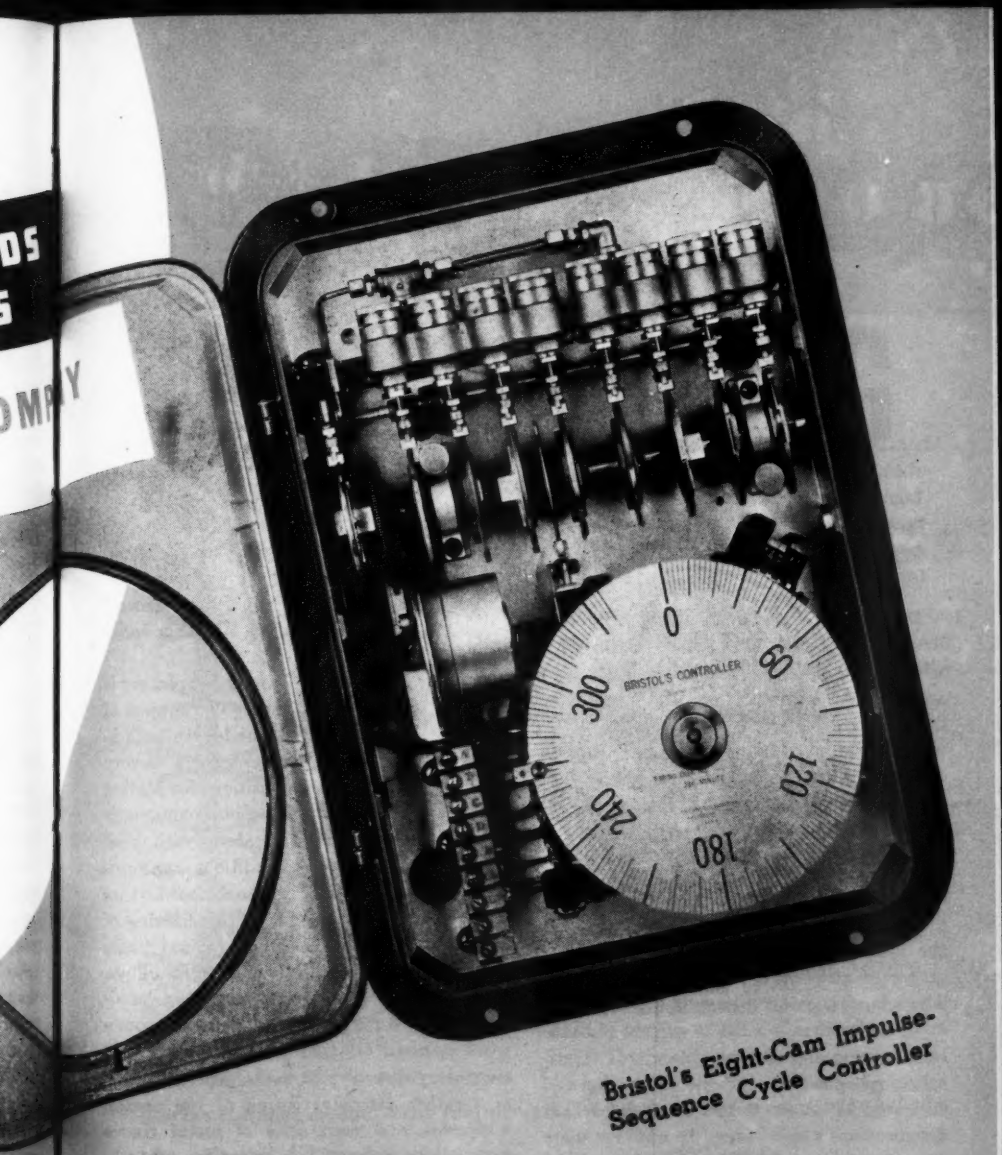

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Manufacturers and Specialists in the

Development of Production Methods and Compositions

By DR. HAROLD J. READ

Associate Professor of Metallurgy—The Pennsylvania State College

METAL INDUSTRY HANDBOOK AND DIRECTORY, 1947 edition, xvi + 468 pages. The Louis Cassier Co., Ltd., Dorset House, Stamford St., London, S.E. 1. Sent free to subscribers to the weekly *Metal Industry* @ £2.5s.6d. per annum.

This handbook, which is devoted entirely to non-ferrous metals, consists of four sections which cover general properties; general data and tables; electroplating, finishing, anodizing; and a directory. While most of the information is generally useful, it must be observed that data on alloys is given only for those of British origin or distributed by British concerns.

The first section of 302 pages on the general properties and mechanical treatment of metals and alloys contains, in addition to the usual data, a series of articles on the properties and uses of the non-ferrous metals which is of more than passing interest. Another useful item is a list of current publications concerning British Standards Institution specifications and the many pages of abstracts of some of the more important specifications which follow. In addition there are extensive specifications for alloys used under the supervision of the Air Ministry and the Admiralty. The section ends with a listing of the makers, compositions, properties and uses of a wide variety of alloys.

Some 75 pages are devoted to general tables and data which provide a good selection of miscellaneous information such as gauge tables, weights of metals in the form of sheets, rods, tubes, etc., thread specifications, temperature conversion tables, prices of metals for the past 28 years and, as the auctioneers' advertisements say, other items too numerous to mention.

The third section of slightly less than 50 pages will be of the most immediate interest to platers since it deals directly with electroplating. The information is in two parts: the larger portion being a discussion of general plating practice, and the remainder a series of the usual tables of data.

The discussion of equipment for plating is limited to sources of current. The subject of cleaning is dealt with at some length both in a general way and particularly for a variety of basis metals. The compositions for plating solutions covering all of the metals commonly electrodeposited are given along with brief notes on the operating conditions appropriate to the various baths. The formal articles include a few paragraphs on the coloring of brass, copper and steel, and several pages on the anodizing of aluminum and its alloys.

The fourth and final part of the handbook is the directory section. This is somewhat unusual in that in addition to the customary directory of manufacturers, there is a rather extensive listing of the names, addresses, and secretaries of metal trades associations and societies, scientific and technical institutions, and various development associations concerned with non-ferrous metals. This information alone might well be worth the cost of the book since it is unusual to find so much of it in one place.

Although the book is well printed on fairly good paper, it is bound only in paper. The index seems to be adequate when tested by spot checks.

Perhaps it might be well to point out that of the 468 pages in the book somewhat over 110 are devoted to advertisements.

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The Effect of the Basis Metal on the Electrodeposition of Brass

W. D. RAE. *J. Electrodepos. Tech. Soc.* **22**, 85–96 (1947).

This work was undertaken in connection with the bonding of rubber to brass where the brass composition is critical. Theory and past work are briefly reviewed. Normally, the brass plate assumes its usual structure shortly after commencement of plating and is not affected by the structure of the basis metal; but when physical or chemical non-uniformity of the surface exists, the subsequent plate may be modified considerably. Physical non-uniformity may beporosity, especially in cast metals, or a state of strain which may be set up by fast machining. Chemical non-uniformity may be caused by uneven distribution of an element throughout a metal. The resulting non-uniformity of plate structure is illustrated with a phosphor-bronze in which the phosphorus was unevenly distributed.

LYMAN B. SPERRY.

Contribution to the Study of the Porosity of Anodic Oxide Coatings on Aluminum and its Alloys

JEAN ODIER. *Metaux, Corrosion-Usure* **20**, 113–119 (1945).

After briefly reviewing existing methods for determining the porosity of anodic oxide films, Odier describes a method of his own consisting of: (a) rinsing the article after oxidation and drying in an oven at 60° C for 2 hours, (b) dyeing at 60° C for 10 minutes in a solution of alizarine green (5 g/l), (c) rinsing and drying at 25° C for 2 hours. The article is weighed after (a) and (c), and the increase in weight per unit area due to the retained water is a measure of the porosity of the coating. The method was used to determine the influence of various factors on the coating quality. Porosity increases with time of treatment and markedly with rise in temperature. Current density, type of current (ac or dc), and composition of the bath and of the alloy being treated are also important factors. The results are interpreted theoretically. The flexibility of anodic oxide coatings is shown to be inversely proportional to their hardness, and operating conditions must be chosen according to the property most desired in the coating.

Hard Chromium

D. CHAMBAUD. *Mecanique* **1946**, 175–177 (July); *Materials and Methods* **25**, 128 (January 1947).

Describes methods used in application of relatively thick chromium coatings, properties of the plate, and applications of the process.

Electropolishing with Fluosulfonic Acid

C. B. F. YOUNG and KENNETH R. RESSE. *Metal Finishing* **45**, 63–67, 84 (February 1947).

Fluosulfonic acid was investigated as an

electropolishing agent for stainless steels, plain carbon steels, and various non-ferrous metals. It was tested in conjunction with phosphoric, sulfuric, chromic, acetic, perchloric, and other miscellaneous acids.

Influence of Various Additions in the Phosphating of Metals. II. Influence of Additions of Nitrates of the Univalent Metals

I. I. HAIN. *Journal of Applied Chemistry* (U. S. S. R.) **19**, Nos. 5 and 6, 527–534 (1946). (In Russian.)

Influences of acidity of the phosphating solution; duration of gas formation; structure, color, and corrosion resistance of the coating were investigated.

Formation and Application of Phosphate Coatings

VAN M. DARSEY and WALTER R. CAVANAGH. *Electrochemical Society Preprint* **91-1** (1947), 14 pp.

Discusses development of phosphate coating of metals; shows how use of metal accelerators and suitable oxidizing agents in the phosphating solution expedites coating formation.

Hard Chrome Plating Finds Wide Use at Ford

HERBERT CHASE. *Iron Age* **159**, 51–53 (January 30, 1947).

Describes many applications and gives details on handling methods, preplating and stop-off techniques, and baths.

Influence of Rotation of Base Metal on the Process of Electrolytic Deposition and on the Displacing of Metals from Solutions of Their Salts

R. PIONTELLI. 6 pages. 1939. Reprint from *Reports of Royal Academy National of Lincei, Section of Physical, Mathematical and Natural Sciences* **29**, No. 7 (1939).

Shows that pure metal deposits in the form of layers, generally quite compact, adherent, and microcrystalline, may be obtained by rotation of the cathode.

Periodic Reverse-Current Electroplating

GEORGE W. JERNSTEDT. *Metal Finishing* **45**, 68–72 (February 1947).

Explains a novel, periodic reverse-current plating cycle in which plating current is reversed briefly at short periodic intervals to deplate unsound and inferior metals deposited in the previous plating period. This technique builds up many microscopically thin increments of sound metal to make a deposit more dense and of greater homogeneity than that possible with conventional continuous-current methods.

Comparison of Electroplated Finishes under Humidity Test

ANON. *Metallurgia* **35**, 63–64 (December 19, 1946).

Illustrations show the results of 21 cycles in a humidity chamber at 60° C and 100 per cent relative humidity. Results give a good idea of the relative merits when subjected to tropical conditions of the respective deposits: chromate passivated cadmium and zinc, phosphate passivated zinc, nickel, nickel and tin, tin and zinc. Results indicate that chromate passivation of cadmium and zinc is definitely advantageous and beneficial.

Electroforming

E. A. OLLARD. *Metal Industry* (London) **70**, 51–53, 86–88 (1947).

The reproduction of articles by electroforming is dealt with in this series, which surveys molding materials, types of mold, conducting surfaces, connections, coverings, types of metal, and solution formulas.

Study of the Process of Cathodic Polarization

R. PIONTELLI and GUIDO POLI. 41 pages. 1942. Reprint from *Memoirs of the Royal Academy of Italy, Section of Physical, Mathematical and Natural Sciences* **13**.

A critical study of the influence of agitation of solution and evolution of gas on the cathodic process in acid and alkaline solutions. 58 ref.

Interference of Gas in the Electrolytic Deposition of Metals

R. PIONTELLI. 28 pages. 1938. Reprint from *Reports of Royal Lombard Institute of Sciences* **72**, Part I (1938).

The formation of cavities in electrodeposited bismuth, copper, iron, zinc, and nickel surfaces is caused by adhesion of gas bubbles on the cathode. Factors influencing this phenomenon were investigated, and are reported with numerous photomicrographs.

The Influence of Base Metals on the Deposition of Different Metals

R. PIONTELLI and G. POLI. 21 pages. 1941-1942. Reprint from *Reports of Royal Lombard Institute of Sciences* **75** (1941-1942).

General theory is thoroughly reviewed from the points of view of energy requirements and metallic structures.

The Theory of Cathodic Processes

R. PIONTELLI. 26 pages. 1942. Reprint from *Reports of Royal Lombard Institute of Sciences* **75** (1941-1942).

After a short review of the most recent theories of the cathodic process, the author proposes a new general theory emphasizing the importance of various factors influencing such processes. 22 ref.

Synchronized Stamping and Plating

DANIEL DEWEY. *Steel* **120**, 94-96 (February 3, 1947).

Describes equipment and procedures involved in manufacture of bumper guards, hub caps, and other automobile parts.

Surface Protection and Adhesion

ANON. *Plastics* (London) **10**, 646-648 (December 1946).

Gives details of a new British synthetic emulsion of the phenolic resin-in-water type. On evaporation of the water, the resin becomes the continuous phase. The alteration in the character of the interface is said to nitiate a reaction which destroys the emulsifying agent and the stabilizer which are thus prevented from adversely affecting film properties. Applications are as sealer or surface coating for porous surfaces and as an adhesive.

Metal Conservation—A National Problem

C. GERHARD DAVIDSON. *Metals* **17**, 11-14 (January 1947).

Country's natural reserves of antimony equivalent to 4 years' supply; lead, 12 years; cadmium, 16 years; zinc, 19 years; copper, 34 years; platinum, 2 years, and tungsten, 4 years.

Chromate Sealing of Anodic Films

TOMASHOV and TYUKINA. *Light Metals* **9**, 22-35 (1946); *C. A.* **41**, 4733 (Aug. 10, 1947).

A translation of two papers taken from Russian investigations on the chromate sealing process of anodic oxide films on clad duralumin. Two new processes have been developed as a result which, compared with the previously used dichromate process, have the following advantages: Films obtained by the first process have greatly improved corrosion resistance, while by using the second it is possible to reduce the consumption of current. The paper goes into considerable detail in describing the investigation and the new processes.

The Formation and Alteration in Thickness of Films Formed at Sharp Corners in the Anodic Oxidation of Aluminum Alloy Components by the Eloxal Process

G. EISSNER. *Aluminum* **25**, 310-315 (1943).

A study was made of the thickness of the film produced, the width of any cracks present, and the included angle formed by the walls of such cracks when aluminum alloy components having sharp edges and corners are subjected to anodic oxidation. Cracks in the film generally occurred at all sharp bends, and the presence of such defects had deleterious effects on the corrosion resistance and dielectric strength of the coating. Such faults can be avoided by careful attention to the design of the article, especially the rounding-off of any V-shaped corners.

The Quantitative Adhesion of Nickel Electrodeposits to Aluminum Alloys

W. BULLOUGH and G. E. GARDAM. *J. Electrodepositors' Tech. Soc.* **22**, 169–188 (1947).

A standard procedure of plating aluminum base alloys by the chemical deposition of zinc method has been developed which which gives an adhesion greater than the tensile strength of the base metal except on alloys containing magnesium or silicon. A hypothesis is advanced which attempts to explain the process on the basis of replacement of aluminum by zinc atoms in the space lattice. For adhesion measurement, an improvement of the Hothersall-Leadbeater method was devised. The latter process consists of placing a close-fitting collar of the base metal over a shaft of the same material, polishing the end of the shaft and collar to a plane surface, stopping off the sides, plating the end, and measuring the force necessary to pull the shaft from the plate, i. e., out of the collar. The improvement consists of tapering the section of the shaft which fits into the collar and machining the inside of the collar so that the shaft may be wedged into it and a closer fit obtained. This practically eliminates any void between shaft and collar.

The standard procedure includes the following steps: 1. Etch in 10 per cent by vol. hydrofluroic acid (40 per cent), 10 per cent nitric acid (sp. gr. 1.42) at room temperature for 2–5 minutes. For Mg-Al and Si-Al alloys, etch 10 minutes or longer. Rinse. 2. Whiten in 50 per cent nitric acid (sp. gr. 1.42). For Si-Al alloys, substitute a 4-minute dip in 98 per cent by vol. nitric acid, 2 per cent by vol. hydrofluoric acid. Rinse. 3. Dip in sodium zincate solution for 2 minutes at room temperature with gentle stirring. Rinse. For Mg-Al and Si-Al alloys, the solution contains 5 g zinc oxide, 10 g caustic soda, and 500 g Rochelle salts per liter. For all other alloys, the solution contains 5 g zinc oxide, 45 g caustic soda per liter. 4. Copper or brass plate for a few minutes in a cyanide solution, making contact before immersing the part; then rinse and plate.

LYMAN B. SPERRY.

The Design and Use of a Photoelectric Absorptiomenter for the Analysis of Solutions Employed for the Electrodeposition of Hard Chromium

H. E. STYLES. *J. Electrodepositors' Tech. Soc.* **22**, 129–154 (1947).

The necessity for close control of bath constituents in the plating of hard chromium is emphasized. A photoelectric absorptiometer was constructed. A photograph of the instrument and a diagram of the hook-up are presented. It differs from the Spekker design in three respects, the most important of which is that the light beam is vertical thereby making a sulfate determination by turbidimetric measurement more practical. Methods for the determination of hexavalent chromium, trivalent chromium, iron, and sulfate, are fully described, and charts are presented.

LYMAN B. SPERRY.

The Application of the Spekker Photoelectric Absorptiometer to the Analysis of Chromium Plating Solutions

W. J. BAYLEY. *J. Electrodepositors' Tech. Soc.* **22**, 121–128 (1947).

The Spekker Photoelectric Absorptiometer is an instrument in which two beams of light from a single source pass through selected color filters to two photoelectric cells. By means of adjustable diaphragms, one of which is calibrated, inserted in the path of the rays, the intensity of light falling on the two cells is adjusted until the electric currents generated by them are equal, as indicated by a zero reading of a sensitive galvanometer. If a colored solution is now interposed in one of the beams of light, the balance is disturbed due to the light absorbed by the solution; the extent to which it is necessary to open the calibrated diaphragm in order to restore the balance is a measure of the intensity of color.

By the use of certain filters in the instrument and the proper preparation of solution samples, many rapid and fairly accurate analyses are possible. This paper describes methods for the determination of hexavalent chromium, trivalent chromium, and iron in chromium plating solutions.

LYMAN B. SPERRY.

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By GEORGE B. HOGABOOM
Consultant, New Britain, Conn.

No. 2,426,254, August 26, 1947—Anodic Treatment of Magnesium and Its Alloys to Form Protective Coatings Thereon—H. Waterman, assignor to Turco Products, Inc.

CLAIM 5. A method of treating magnesium articles to form a protective coating thereon which comprises subjecting the article, as an anode, to electrolytic treatment in an electrolyte consisting of a substantially saturated solution of alkali carbonate at a temperature above about 50° C (optimum 90° C) while imposing a voltage sufficient to maintain a current density at the beginning of the formation of the coating of above 50 amperes per square foot and continuing the anodic action until the current flow decreased to a relatively small value, while determining the characteristics of the coating being formed by measuring the rate of decrease in current density caused by the formation of the coating and discarding the articles so treated which give erratic current density and which never attain coatings with a predetermined electric resistance.

LEGEND: I find sixty minutes to be adequate in most cases and after such period of treatment using a magnesium object of proper quality, the current density will have dropped to as low as 0.04 amperes per square foot.

9 Claims.

No. 2,426,962, September 2, 1947—Process for Making Measuring Tapes—E. J. Witchger, assignor to Lufkin Rule Company.

CLAIM 8. The method of making a graduated measuring strip comprising etching the surface of ribbon steel and then treating said surface with an acid phosphate rust-proofing agent reactive with the metal of said ribbon to produce a surface on said ribbon having corrosion resistance and substantially glare free diffused light-reflecting characteristics, applying electroplate resist to predetermined indicia areas of the strip for defining markings including measuring indicia, and electroplating metal coating having legible color contrast with said indicia areas on the areas of the strip not covered by the resist, said metal coating assuming the substantially glare free diffused light-reflecting characteristics of the underlying surface of said strip.

NOTE: The electroplates used are silver, nickel, or nickel-chromium.

8 Claims.

No. 2,427,661, September 23, 1947—Control of Electrolytic Processes—W. G. Cook, assignor to Westinghouse Electric Corporation.

In the manufacture of electrolytically coated or plated materials such as tin plate, the material to be coated may be continuously passed through the electrolyte while the continuous length of material is formed by attaching the leading end of each successive material length to the following end of each preceding length of material. This procedure requires that normal speed of movement of length of material through the electrolyte be reduced while each attaching operation is taking place.

The quantity of electrolytically deposited material is a function of the current density and the length of time the material is subjected to the electroplating process. It will be apparent then, that when the speed of travel of material through the electrolyte is reduced, the density of the plating current will have to be reduced to avoid wasting the plating material by making too great a deposit of the plating material on the length of the material that is being plated.

CLAIM 7. In a control system for an electrolytic process wherein a length of material is passed through an electrolyte, means of supplying variable amounts of current to the process, first generator means operable to supply a potential proportional to the speed of travel of the material, second generator means operable to supply a potential proportional to the current supplied, regulator means operable to control the output of said current supplying means, said regulator means being connected to respond to said second generator potential, a separate source of potential, a first potentiometer connected across said separate source and having one of its terminals connected to one terminal of said first generator means, a second potentiometer having one terminal connected to the opposite terminal of said first generator means and the variable terminal of the first potentiometer, a third potentiometer having one terminal connected to said opposite terminal of first generator means and its other terminal to the variable terminal of the second potentiometer, thereby to provide for selectively adjusting the regulator means to determine the maximum current supplied to the process and the rate of variation of said current with respect to the speed of the material over a predetermined speed range.

7 Claims.

No. 2,427,771, September 23, 1947—Control of Electrolytic Processes—J. R. Erbe, assignor to Westinghouse Electric Corporation.

CLAIM 7. In a control system for an electrolytic process wherein a length of material is moved through an electrolytic bath, a main generator for supplying variable amounts of current to the bath, said generator having a field excitation winding, a variable voltage exciter for main generator, a first pilot generator operable to develop an output voltage proportional to the speed of movement of the material through the bath, circuit means connecting the exciter and said pilot generator in series circuit relation with the field excitation winding of the main generator, whereby the current supplied to the bath is roughly proportional to the speed of the material, a second pilot generator operable to develop an output voltage proportional to the speed of movement of the material, a third pilot generator operable to develop an output voltage proportional to the current supplied to the bath by main generator, regulator means jointly responsive to the output voltages of the second and third pilot generators operable to control the excitation of the variable voltage excitor to cooperate with said first pilot generator in the control of the output current of the main generator to maintain a predetermined proportionality between speed of the moving material and the current supplied to the bath regardless of the speed at which the material is moved through the bath, and means operable to vary the voltage output of the said third pilot generator independently of the current output of the main generator to cause the regulator to maintain any desired ratio of speed and current.

7 Claims.

No. 2,428,033, September 30, 1947—Manufacture of Rustproof Electrolytic Coatings for Metal Stock—J. S. Nachtman.

It is the fundamental object of the present invention to provide methods of making new and improved types of coatings for steel products, which coatings are considerably more rust resistant than the present available types of coatings if the same amount of coating material is used; or which coatings have rust resistance equal to present types of coatings while using say not more than one-half of the amount of coating material at present used in order to create a substantial saving in vital materials now needed for defense purposes.

CLAIM 1. A method of making steel strip

and the like suitable for deep-drawing, stamping and forming, comprising electroplating on cold-rolled hard unannealed steel strip base stock at least three layers of two metals selected from the group consisting of tin, lead, zinc, iron, nickel, chromium, copper, bismuth, antimony, cadmium and silver, one of said two metals having a melting point appreciably above the other and with the higher melting point metal directly on the base stock and with the lower melting point metal between two layers of the higher melting point metal, then so heat treating the base stock between 1100° F and 1800° F under non-oxidizing conditions as to anneal the base stock and form at least two partial alloy layers of substantial thickness but no greater than 0.0005 inch between adjacent plated metal layers, and then cold rolling the plated annealed strip.

NOTE: Four examples cited.

3 Claims.

No. 2,428,055, September 30, 1947—Composite Selenium Electrode—A. von Hippel and J. H. Schulman, assignors to Federal Telephone and Radio Corporation.

In the use of selenium plating arrangements in which metallic selenium is deposited on a cathode we have found:

1. That unless the anode material consists of a substance inactive to the electrolyte and to the anodic products of electrolysis, the anode is attached and destroyed either by the chemical action of the reagents of the bath alone or by the electrochemical action when current is passed; and

2. Even if the anode material does consist of such an inactive material, the passage of current is attended by a copious and undesirable evolution of gas at this anode and it also causes a depletion of the selenium content of the plating solution.

We have discovered that carbon, platinum, gold, and palladium are suitable materials for mixing with selenium for this purpose. Of these, carbon is preferable owing to its cheapness.

CLAIM 1. An electrode comprising a porous container, a conductor within the container and a conductive solid body comprising coherent compressed selenium-carbon powder within the container around the conductor.

CLAIM 2. An electrode according to Claim 1 in which the conductor is a non-reactive material of good conductivity from the group consisting of platinum, gold and graphite.

CLAIM 3. An electrode according to Claim 1 in which the container is of fiber glass.

CLAIM 4. An electrode according to Claim 1 in which the porous container is of ceramic material.

CLAIM 5. An electrode according to Claim 1 in which the porous container comprises sintered glass.

5 Claims.

No. 2,428,141, September 30, 1947—Process for Cleaning, Stripping and Polishing Metal Surfaces—T. E. Burkhardt, assignor to General Motors Corporation.

Heretofore, highly alkaline solutions such as sodium orthosilicate solutions have been used for electrolytically cleaning metal surfaces. It was found that such processes did not perform a sufficiently good job of cleaning and removing oxide and scale.

I have found that by the use of phosphates in conjunction with other means, such as a wetting agent or electric current or a suitable acid or any combination of these, metal surfaces may be cleaned almost absolutely free from all traces of oxide and scale. Preferably my process employs an electrolyte formed of a low alkaline solution having a *p*H value less than 10.5, preferably a low alkaline phosphate solution such as one selected from a group consisting of tetrasodium pryophosphate, sodium metaphosphate, and sodium hexametaphosphate . . . To obtain more rapid action, a suitable wetting agent, a suitable acid, or both may be included in the electrolyte. In some cases the process may be used non-electrolytically.

CLAIM 1. The process of electrolytically cleaning, stripping copper from, and polishing the surface of ferrous articles which comprises immersing said surfaces in an electrolyte consisting of essentially an aqueous solution of between two and ten

ounces per gallon of tetrasodium pyrophosphate maintained at a temperature above 180° F and passing a direct electric current at a potential between seven and twelve volts from said surfaces as anodes to a suitable cathode in contact with said electrolyte

4 Claims.

No. 2,428,318, September 30, 1947—Electrolytic Deposition of Rustproof Coatings—J. S. Nachtman.

The present invention comprehends that the heat treating and cold working operations may be divided into alternate steps, repeatedly carried out, if desired.

CLAIM 1. A method of making steel strip and the like comprising electroplating on steel strip base stock at least three layers of two metals selected from the group consisting of tin, lead, zinc, iron, nickel, chromium, copper, bismuth, antimony, cadmium, silver and alloys thereof, one of said metals being between two layers of the other metal, then heat treating the base stock in a non-oxidizing atmosphere at a temperature below the annealing temperature of the base stock and below the melting point of the lower melting point metal, the time and temperature of heat treatment being sufficient to form two thin partial alloy layers of adjacent plated metals of substantial thickness but no greater than 0.0005 inch between said adjacent plated metals.

NOTE: Six figures illustrate the layers of different metals that can be used.

No. 2,427,280, September 9, 1947—Nickel Electroplating Composition—R. A. Hoffman, assignor to E. I. du Pont de Nemours and Company.

Nickel plating baths have heretofore been modified by the inclusion of sulfonic acids or sulfation products of various organic compounds. Nickel plating baths containing such addition are of improved character but much is left to be desired. While the prior art addition agents have usually effected some improvement in the character of deposit, the agents individually are not sufficient to produce commercially desirable deposits and they must be used with another and sometimes with even two or more supplemental addition agents. Sometimes the addition agents while improving nickel deposits with respect to one characteristic, say brightness, are actually deleterious as to other essential characteristics such as ductility and freedom from pits. Either alone or in combination with other addition agents these sulfation and sulfonation products have not been all that could be desired . . .

It is an object of the present invention to provide nickel plating compositions and processes of improved character . . . It is a still further object to provide addition agents which may advantageously be used in nickel plating compositions and processes as a sole addition agent or which may advantageously be used with other addition agents.

Eleven example solutions are cited.

No. 1

Nickel sulfate	350 grams/liter
Nickel chloride	15 grams/liter
Boric acid	35 grams/liter
2-phenyl-ethylene sulfonic acid	3 grams/liter
Temperature	50° C
*p*H	3.8
Current densities	5–80 amp/sq.ft.

No. 5

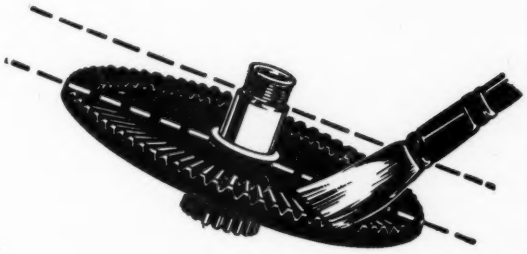
Nickel chloride	250 grams/liter
Nickel sulfate	15 grams/liter
Boric acid	50 grams/liter
2-furylpropionaldehyde 1-methyl-1-sulfonic acid	4 grams/liter
Temperature	55° C
*p*H	3.2
Current densities	5–60 amp/sq.ft.

CLAIM 1. A nickel plating composition for dissolving in water to make an aqueous plating bath comprising nickel chloride, nickel sulfate, and 2-phenyl-ethylene sulfonic acid.

NOTE: The addition agents of the present invention may be used advantageously in the nickel solutions patented by Lutz-Westbrook, Schlotter, Waite, Pine, Harshaw and Fleet or Lind-Harshaw-Long.

2 Claims.

UNICHROME stop-off lacquers



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EASILY APPLIED—by brushing, spraying or dipping—these tough synthetic lacquers assure clean-cut edges, withstand hot cleaners and acid dips, and will not contaminate plating baths.

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Stop-off 322 (Black) Extra adherence for severe cycles, including hot cyanides. Removed by dissolving in Remover 322-RA.

Stop-off 323 (Red) For Chromium and other moderate-temperature cycles. Readily peeled off at room temperature.

Stop-off 324 (White) For all high temperature solutions. Resists hot alkaline cleaners, vapor degreasers for limited time. Easily peeled off while warm.

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BRANCH NEWS

BRIDGEPORT BRANCH

The regular monthly meeting on September 5 had an attendance of forty-five members and guests.

EUGENE PHILLIPS and WILLIAM EHRENCRONA of the Outing Committee gave a final report on the outing on August 23 on the William Ehrencrona estate in Trumbull, Conn. It had the largest attendance in the history of the Branch, fine weather, good food and refreshments. It netted the Branch $57.15.

CHARLES TEMPLE, Chairman of the Membership Committee, reported one new application for membership. The request of one member for transfer to the Newark Branch was granted.

The Secretary was instructed to have a printed form sent to all members with request for information on open or wanted situations. A. R. McNeil or the Secretary will act as intermediaries.

C. L. TEMPLE, W. A. EHRENCRONA and A. R. MCNEIL presented a detailed report of the Detroit Convention.

PRESIDENT F. B. GOTTHARDT then turned the meeting over to LIBRARIAN A. J. CHENIS who called upon some of the members to comment on the interesting things that they had seen during the Convention.

JOSEPH G. STERLING,
Secretary-Treasurer.

BRIDGEPORT BRANCH

A. J. CHENIS served as the Technical Chairman of the Open Meeting and Educational Session on September 19 in the Burrough's Public Library Auditorium.

After a brief talk he introduced MR. ARTHUR W. LOGOZZO of the Nutmeg Chrome Corporation, Hartford, Conn., A. E. S. Second Vice-President. Mr. Logozzo first spoke briefly about the plans for Revision of A. E. S. Constitution, the exhibits at the Detroit Convention, and the A. E. S. Research Program.

This was followed by a talk on "Bright Nickel and Decorative Chromium Plating" which covered many important mechanical, electrical and chemical aspects of the plating department and was illustrated with slides and charts. The session proved most interesting and provoked considerable discussion.

JOSEPH G. STERLING,
Secretary-Treasurer.

BOSTON BRANCH

The following were elected to office at the June 5 meeting:

President—ANDREW W. GARRETT
First Vice-President—LOUIS V. GAGNON
Second Vice-President—EDMUND S. JEVELY
Librarian—MANSON GLOVER
Sergeant-at-Arms—CHARLES O. HARDY
Secretary-Treasurer—GEORGE P. SWIFT
Board of Managers—ERNEST CALLAHAN, EUGENE CARTER, and JOSEPH SULLIVAN

They were installed by ARTHUR MINTIE.

LIBRARIAN LEONARD CHESWORTH had obtained MESSRS. COBLEIGH, SWENSON and BEARDSLEY of the Behr-Manning Corporation as speakers and operators during a belt finishing demonstration. Types and sizes of abrasives were discussed, and a movie of the manufacture of abrasive paper was shown.

GEORGE P. SWIFT, *Secretary.*

BOSTON BRANCH

During the October 2 meeting it was voted that Boston would welcome the Fourth International Electrodeposition Conference in connection with the 1950 Convention in Boston.

LIBRARIAN MANSON GLOVER was appointed Chairman of the Annual Educational Session and Banquet which is to be held Saturday, April 17, 1948 in Hotel Statler, Boston. Mr. Glover was also appointed temporary chairman of the 1950 Convention Committee.

Four applications were turned over to the Board of Managers.

DR. DANIEL GRAY of Oneida, Ltd. spoke on "Atomic Energy and Its Relation to Metal Refining and Plating". He described the development of the atomic theory from early days to the present in a manner easily followed and actually understandable by the layman. The demonstration of simple models of hydrogen and helium atoms which showed protons, neutrons and electrons was particularly instructive. Reference was made to the large amount of energy theoretically obtainable, and the development of methods for releasing some of this energy from uranium was explained. Prospective uses of this energy for radioactivity, transmutation, power and the atomic bomb were discussed, and present applications of radioactivity as a research tool in metal cleaning and plating brought out. A series of questions followed.

GEORGE P. SWIFT, *Secretary.*

BUFFALO BRANCH

The new season was opened on September 12 with a dinner meeting at the Markeen Hotel. We were honored to have as our guest DR. M. M. BECKWITH of the Harshaw Chemical Company, who spoke to us about "Fluoborate Plating Solutions". Following a review of the history of fluoborates, a comparative study was presented of the various fluoborate baths and their analogous standard acid baths. The discussion that followed was a sure indication that Dr. Beckwith's paper had rung the bell.

H. A. FUDEMAN was elected Secretary to succeed H. K. CARPENTER, resigned.

A committee headed by BILL HART is making lavish plans for the annual Christmas Party on December 13. From the sound of things this party promises to make A. E. S. history.

H. A. FUDEMAN, *Secretary.*

COLUMBUS BRANCH

MR. C. A. VAN DEREAU, Works Manager of the Mansfield, Ohio, plant of the Westinghouse Electric Corporation, was host to approximately seventy-five members of the Columbus and Dayton Branches on September 5. After luncheon in the plant's cafeteria, Mr. Van Dereau, a Past President of the A. E. S., gave a brief account of the history of the Mansfield plant and the development of its present streamlined organization. He interspersed his remarks with amusing reminiscences of the early days of the Society.

A two-hour tour of the plant followed, with the department supervisors serving as guides. Of particular interest were the many plating units used to apply finishes on the diversified line of electrical appliances and parts. The plating division utilizes a generator output of approximately 250,000 amperes, with copper, nickel, and chromium comprising the bulk of the plated metal.

A. B. TRIPLER, JR.,
Second Vice-President.

DETROIT BRANCH

The October 3 meeting was attended by approximately one hundred and seventy-five members and guests.

After R. L. REDMOND, Chairman of the Entertainment Committee, had informed us of the plans for the Christmas party, an enjoyable color motion picture was shown, entitled *Southern Arizona.*

MR. WILLIAM PHILLIPS of General Motors Research spoke about plating specifications. He cited not only General Motors specifications but also similar specifications from other companies and presented field results which showed how effective these specifications were in aiding in the production of parts which were suitable for the service intended.

This being father and son night, MR. MALCOLM PHILLIPS of Advance Plating Company then covered the subject of how to meet plating specifications. He described some of the problems of the contract plater and gave suggestions on how to improve the relationship between vendor and customer for their mutual benefit. Both talks

were extremely well presented, and each brought out a number of important points for thought.

R. H. DUDLEY,
Publicity Chairman.

GRAND RAPIDS BRANCH

PRESIDENT F. D. PACE opened the first monthly meeting of the 1947–1948 season on September 12 in the English Room of the Rowe Hotel.

Two fine films, *Tournament of Roses Parade* and the *Illinois-U. C. L. A. Rose Bowl Game*, had been obtained by LIBRARIAN L. B. SPERRY and were shown to the members and guests.

Six applications for membership were received.

A Membership Committee and a committee to study the new Constitution of the A. E. S. were appointed. Several other committees were established to run our Annual Dinner-Dance on January 24.

The technical feature of the evening was a session on filtration. MESSRS. H. W. FAINT of Industrial Filter and Pump Manufacturing Company, R. J. AMBERG of Celite Division, Johns-Manville Corporation, and W. A. HELBIG of Darco Corporation presented very provocative papers on filtration and purification of plating solutions. A demonstration with an all-Lucite filter set-up furnished by the Industrial Filter and Pump Manufacturing Company added special interest.

The meeting closed with the usual buffet.

JACOB M. HAGE, *Secretary.*

INDIANAPOLIS BRANCH

About thirty members attended the first regular meeting of the season held on September 3 in Fox's Steak House.

There were two applications for membership. Two suspended members were reinstated on payment of back dues. One resignation was accepted.

A "Ladies' Night" will be held later in the year.

The guest speaker was DR. E. P. MILLER, Research Director of Harper J. Ransburg Company. His talk, "Electrostatic Application of Paint Coatings", was accompanied by lantern slides and was well received.

J. MONAGLE, *Secretary.*

LANCASTER BRANCH

The regular monthly meeting was held on September 12 in conjunction with a two-hour tour of the R. C. A. plant in Lancaster enjoyed by twenty members and guests.

In this plant, we saw radio tubes being made for television receiving sets and for broadcasting stations. The tubes were transported from place to place by means of overhead conveyor systems. We observed tubes being sealed by automatic machinery, conveyed to electric ovens where they go through a degassing process and then finally to the inspection room where they are subject to two inspections, forty-eight hours apart, to insure accuracy and safety. We then went to the plating room where DR. BRIGGS spoke about the problems and the work that is being done there.

Following a delicious dinner at the Stock Yards Hotel, Lititz Pike, a business meeting was called to order by PRESIDENT THEODORE SCHWALM. There were twenty-five members and guests present at the meeting. A report of our picnic, held this summer, was given by ROLAND HOENSTINE. WILLIAM KLUNK reported on the Convention. Plans for a Ladies' Night to be held in December were discussed, and the following committee was appointed: ROLAND HOENSTINE, Chairman, HARRY HOVIS, CHARLES SNYDER, NORMAN GEBERT and ELLIS HUNTER. Two applications were referred to the Board of Managers. After the business meeting, we were entertained with three short movies by our President.

H. CLAY BRUBAKER, *Secretary.*

LOS ANGELES BRANCH

The first meeting of the fall season was held on September 10 at Scully's, 4801 Crenshaw Boulevard, Los Angeles. Over one hundred persons, including twenty-three guests attended.

A new order of business was followed to shorten the meetings as much as possible. The visitors were introduced, minutes and financial reports read, and as many com-

mittee reports as possible given during the dinner.

JACK BEALL reported on the picnic held at Ladera Park on August 10.

MITCHELL RASKIN announced the course he is giving at Woodbury College covering the science, techniques and practices involved in electroplating. The course is being sponsored by the Extension Division of the University of California at Los Angeles.

DELEGATES DON BEDWELL, LEO ATIMION and JACK RASKIN reported on the Detroit Convention.

EARL COFFIN was appointed Chairman of the 1948 Banquet Committee.

Sixteen new members were initiated.

JOHN MILLHORN announced the availability of a booklet published by Alcoa on "Electroplating on Aluminum" and introduced the speaker, MR. HAROLD KROEACHE of Harshaw Chemical Company who spoke on "Perflow, a New Method of Electroplating Nickel". The Perflow bath is a modified Watts type bath producing ductile nickel plate suitable for buffing.

DEAN WILLIAMS, *Secretary.*

MILWAUKEE BRANCH

The new season opened with a grand affair at Racine. Racine and Kenosha members were the hosts and did an excellent job all around. LOUIS BUSH, Racine, who headed the committee, deserves special credit.

ROBERT STEUERNAGEL, SR. and JACK GEISSMAN, deceased members, were honored.

Milwaukee Branch was given a resume of what to expect when the National Convention comes to Milwaukee in 1949.

JAMES DURNFORD,
Secretary-Treasurer.

PHILADELPHIA BRANCH

The September meeting was a dinner meeting in the newly decorated Broadwood Hotel with an attendance of seventy.

LIBRARIAN HIRSCH introduced DR. D. GARDNER FOULKE of the Hanson-Van Winkle-Munning Company who gave an illustrated lecture on "Periodic Reverse Current Electroplating Process". Much interest was shown and the questions were many, with one of the members stating his own experiences.

Three applications for membership were referred to the Board of Managers. Three applicants were elected, and one in-transfer and one out-transfer were approved.

PAUL MENTZER, SR., *Secretary.*

PITTSBURGH BRANCH

The first meeting of the year was held at the Northside Y. M. C. A. on September 11, and was preceded, as usual, by a dinner.

A. E. S. FIRST VICE-PRESIDENT SAM JOHNSTON reported on the Detroit Convention, discussed the Exposition, and dwelt in some detail on the action taken with respect to the proposed Constitution Revision. Ed J. SMITH, Chairman of the Picnic Committee, reported on the very successful Stag Picnic held on August 23 at the Spring Valley Frozen Food Locker Plant Farm. After considerable discussion it was decided that the Housing Committee should try to find a more suitable location than the Y. M. C. A. for the remainder of the year. PRESIDENT HENNESSY appointed as additional members of the Housing Committee ARTHUR F. KAUPE, GLENN HERRING, and G. C. JENISON.

A number of membership applications were received.

LIBRARIAN R. J. GOLDBACH presented an excellent list of speakers promised for future meetings and introduced MR. THOMAS TROWBRIDGE of the Behr-Manning Corporation who gave a very interesting talk on applications of coated abrasives in the metal working field, many of which, new to those present, were shown with the aid of large pictures. He also demonstrated actual operating polishing equipment.

R. A. DIMON, *Secretary-Treasurer.*

PROVIDENCE-ATTLEBORO BRANCH

A hearty welcome was extended by PRESIDENT LONSBURY to the nineteen guests present at our September meeting. Their presence was the result of much hard work by RAY MITCHELL and his Membership Committee.

MR. RALPH MCCAHAN of E. I. duPont de Nemours and Company, who has spent many years trouble shooting in this field, described the most frequently recurring diffi-

culties with cyanide plating baths and how to overcome them. The short question period which followed was resumed as soon as the meeting had adjourned and ended only when the speaker had answered a large number of questions from numerous small groups.

Total attendance was sixty-two.

EDWARD A. PARKER, *Secretary.*

ROCHESTER BRANCH

The following officers were elected at the September 19 meeting:

President—ROBERT FLINT
First Vice-President and Steward—JOHN McGUIRE
Second Vice-President—JOSEPH HULL
Secretary—JAMES WEAVER
Treasurer—FRED WAGNER
Librarian—CHARLES HENDERSHOTT
Board of Managers—CECIL THORNTON, DONALD BLUM, JOHN ADAMS, FRANCIS DOUGHERTY, and WILLIAM TUCKER

The Steward, Mr. McGuire, will have the special duty to introduce new members.

Suggestions were received as to meeting topics during this year. CHARLES HENDERSCHOTT, our new Librarian, will endeavor to arrange a schedule accordingly.

RAYMOND BERGHOLD was appointed Chairman of the committee which will arrange the Christmas Party.

ROBERT L. FLINT, *President.*

ST. JOSEPH VALLEY BRANCH

The May 7 meeting, designated "Ladies' Night", brought out approximately fifty members and forty ladies.

The evening began at 6:30 P. M. with cocktails. After the dinner at 7:30, the ladies were shown movies while the men had their business and technical session.

Three applications for membership were received and voted upon immediately in order that these people might enjoy the benefits of the Society throughout the summer months.

PRESIDENT KEN HARLAN then turned the meeting over to the Librarian, HAROLD WIESNER, who introduced MR. WILLIAM PHILLIPS and MR. F. L. CLIFTON of the Research Laboratory Division of General Motors Corporation.

Mr. Phillips gave a very interesting talk on "The Durability of Plated Parts" with a number of slides and panels showing the results of exposure tests.

Mr. Clifton demonstrated a new type of plating cell developed by General Motors.

At the close of the question period, the new officers for 1947–1948 were installed by R. D. WYSONG.

The ladies and men then enjoyed a social gathering.

HAROLD J. WIESNER,
Secretary-Treasurer.

SAN FRANCISCO BRANCH

Fifteen members and one guest attended the September meeting in El Jardin Restaurant, San Francisco.

MR. EARL LOESCH, now with Progressive Plating Works, Oakland, gave a very interesting discourse on plating conditions in Los Angeles. His talk was enjoyed by all and precipitated a very lively discussion.

Each member who is in arrears for dues a year or longer will be contacted by telephone to determine whether or not he wishes to pay his dues or be dropped from the membership list.

JACK HITE, *Secretary-Treasurer.*

SOUTHEASTERN BRANCH

Ladies' Night on September 18 in the Candelite Cafe on Buford Highway proved a huge success; it was attended by a nice crowd and was enjoyed by all. After an excellent supper, the evening was spent dancing and getting acquainted.

This was the first affair of this kind given by the Branch and assuredly it will not be the last.

WILLIAM T. WEYMOUTH,
Secretary-Treasurer.

SYDNEY BRANCH

The September 9 meeting at the Chambers of Manufactures was attended by thirty-four members and visitors.

Two new members were elected and the reinstatement of one member was ratified by the meeting.

A letter from the Executive Secretary was read informing us that in the future THE

MONTHLY REVIEW and the *Proceedings* would be forwarded in bulk to the Secretary of the Branch to be distributed to the members. It was decided to discuss the matter with the other Australian Branches to see what their attitude was towards the scheme.

After reading a letter from the President of the Melbourne Branch who asked us to cooperate in helping the platers in England with their food problem, it was decided to get a list of names and addresses from Melbourne and try to induce some of our members to send food parcels to England.

The Social Secretary reported that plans for the Annual Smoko were well under way and an excellent night comparable with the 1946 Smoko was expected.

The Chairman of the Educational Committee reported that a visit to the plant of Austral Industrial Products had been arranged for the November meeting and that members would be given full details later.

MR. W. H. MILLWARD gave a talk on P. R. Plating which was well received by the meeting. The question box was conducted by PRESIDENT E. J. WRIGHT.

J. R. GODFREY, *Secretary*.

TORONTO BRANCH

The Fall and Winter season got off to a very impressive start with twenty-four members turning up for dinner and another thirty attending the meeting which followed.

HAROLD BUNTING won the usual raffle for a donated prize. Since he is something of an abstainer, the prize will last a little longer than it would have, had it been won by some of the other members.

Very interesting moving pictures of *Forest Industries* and *Evils of Forest Fires*, loaned by the National Film Board and shown by a member of the Junior Board of Trade, were a great addition to our meeting; ARCHIE SMITH, our Program Chairman, is to be congratulated for arranging them.

The speaker of the evening was MR. ALEX POTTINGER of the Canadian Westinghouse Company who gave a talk on rectifiers, their whys and wherefores and behavior. Even if the members did not understand it all, they at least know a great deal more now than they did before the meeting.

After Mr. Pottinger's talk, WILLIAM PRICE, our Delegate to the Convention, gave a short summary of his activities while on Branch business.

One very serious thought he brought home from the Convention was that there are probably only half a dozen cities, all of which are in the States, which can accommodate an A. E. S. Convention and Exposition.

There were two applicants elected to membership and six applications, including one from England and one from New Zealand.

KERGAN WELLS.

WATERBURY BRANCH

PRESIDENT HENRY STROW opened the season's first meeting on September 12 in the Colonial Room of the Hotel Elton. Dinner was served at 6:30 P. M. as usual prior to the formal meeting at 8:00 P. M.

A very fine technicolor movie, furnished through the courtesy of International Silver Company, portrayed the history, development and present-day fabrication methods of silver-plated tableware.

This was followed by a very interesting talk by MR. R. A. BENSON, JR., of the Southern New England Telephone Company on "Future Developments in Telecommunications". Dial service to any part of the country will be an accomplished fact in the near future. Potential customers who are now isolated from telephone lines will soon be served over power lines or by radio. Wire service will be supplemented by directional radio service, and the coaxial cable will carry more and more conversations simultaneously. Mobile highway service will soon be common, the first unit now being in operation between New York and Boston. It serves cars, trucks, and buses and also boats on the Sound. Railway telephone service is now beyond the experimental stage. Many of these remarkable developments in communications were begun as a result of wartime necessity and are now being applied to make better peacetime living.

Following Mr. Benson's talk, refreshments were served.

S. L. HENN, *Secretary*.

Coming Event

NEWARK BRANCH

The Newark Branch takes pleasure in extending to you a cordial invitation to attend its Annual Winter Educational Session on December 20 in the Robert Treat Hotel, Newark, at 2:30 P. M.

In its earnest desire to accelerate the progressive trend shown in the plating industry in recent years, the Educational Committee of the Newark Branch takes pleasure in presenting the following pertinent and educational subjects by well qualified speakers:

1. "Electroplaters' Metals of the Future" by Dr. F. A. Lowenheim, Metal and Thermit Corporation, Rahway, N. J.
2. "Periodic Reverse Plating" by Mr. Myron B. Diggin, Hanson-Van Winkle-Munning Company, Matawan, N. J.
3. "Surface Finishing of Aluminum and Its Alloys" by Mr. Milton Nadel, Consolidated Razor Blades, Jersey City, N. J.

The discussion period which follows each presentation is proving both entertaining and informative. Many problems are being solved during these periods.

In keeping with the spirit of the season, the Branch will hold its Annual Christmas Party following the Educational Session. We will be honored to number you among our guests. A good time is assured.

A full course dinner will be served at 7:30 P. M., and excellent entertainment and music will be provided during the remainder of the evening.

May we suggest that you reserve this date, December 20, for the Newark Branch Educational Session and Christmas Party.

WILLIAM F. BRUHNS, *Publicity.*

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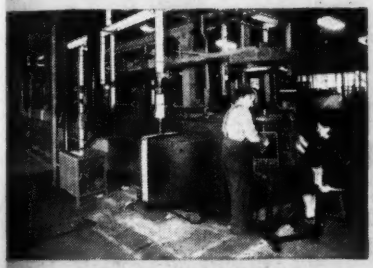

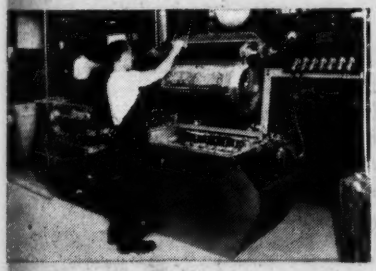

Udylite Plating Barrels and Udylite Automatic Plating Machines are reducing costs and improving the product at the Metal Finishing Division of Pyrene Manufacturing Company.

Makers of the famous Pyrene Fire Extinguishers and Pyrene Tire Chains plate a variety of their own small parts in Udylite Plating Barrels. In addition they do a large volume of diversified plating work for other concerns.

Udylite Plating Barrels are fast and economical in plating parts too small for efficient racking. Springs are cadmium plated—ball checks are tin plated at Pyrene.

The Udylite Automatic Plating Machine does a complete job on the Pyrene Tire Chains. After being loaded in racks, the chains go through various cleaning, rinsing and plating solutions automatically—are not touched or handled until cycle is completed and they are unloaded, fully plated. Udylite Automatics are fast, economical and very compact—require less floor space than any other comparable equipment.

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MR 11

The Readers' Corner

To THE EDITOR:

As a matter of technical interest, the reader of Mr. Mazia's paper in the August issue will attain an incomplete impression of the history of electropolishing. The Burns and Warner patent of 1928 was not directed toward electropolishing of metals, and, therefore, cannot be considered as anticipating electropolishing. As far as I know, the first successful commercial use of electropolishing antedates the processing of aluminum reflectors and relates to equipment processed in France in 1929–1930. The earliest known date for electropolishing as having primary interest is 1916 when a German patent issued on electropolishing silver-plated tableware. This fact is referred to in my article in the 33rd Annual *Proceedings*. I have personally asked Dr. Jacquet, at the time of his visit in the United States, if he knew of any earlier date than that of this German patent. He said that he was not aware of an earlier date.

CHARLES L. FAUST.

Mr. Mazia's reply follows:

To THE EDITOR:

My thanks are due Dr. Faust for his illuminating discussion of my paper on electropolishing which appeared in the August issue.

His mention of the German patent issued in 1916 on silver-plate polishing had escaped my notice, and I am grateful for this additional information. It is of interest to note that electropolishing of silver and silver plate has recently been reported as a practical commercial process. It is effected by controlled anodic treatment of the silver in the silver plating bath.

As to my statement that the Burns and Warner patent "anticipates" the later disclosures of electropolishing, this still is true in my opinion. Experimentally, I have verified the statement of the inventors that when the electrolyte temperature and concentration of orthophosphoric acid are carefully regulated, a brightly polished, uniformly etched surface is produced on steel treated as anode in the bath. Of course, the results of this treatment are not nearly so good as those obtained by the Battelle method, and much higher current density is required for luster development. However, there is no doubt in my mind that the process of electropolishing was "anticipated" by the work of Burns and Warner.

My reference to Alcoa's "Alzak" process as the first successful commercial use of electropolishing should have been further qualified by the phrase "in America" as pointed out by Dr. Faust.

JOSEPH MAZIA.

E.T.S. Has A.E.S. Publications

By arrangement with the American Electroplaters' Society, its sister organization, Electrodepositors' Technical Society, 27 Islington High Street, London, N. 1, England, has been supplied with files of THE MONTHLY REVIEW beginning with the 1930 issues and with copies of the *Proceedings* beginning with the 1942 volume. The exchange copies received during the last two years bring the E. T. S. collection up-to-date.

These publications will be available to the forty-five A. E. S. members who reside in Great Britain.

1948 Convention Committee

MR. HOWARD COBB has accepted the appointment as Co-Chairman of the committee which will handle the Industrial Finishing Exposition. He will serve with MR. GEORGE WAGNER, Chairman.

Society Publications

We are happy to acknowledge receipt of a number of early issues of THE MONTHLY REVIEW and the *Quarterly Review* of the National Electroplaters' Society from MR. JOHN R. HEIZMAN of Reading, Pa., member of the Philadelphia Branch.

They will be used to build up the files of Society publications in libraries designated by the Branches.

Stainless Steel Versus Plating

A check of future prospects for plating in the Detroit area made by the *National Association of Metal Finishers* indicates that stainless steel is finding favor with several large automobile manufacturers. To many, this plain statement is not news. Stainless steel has been used on cars for years and has never seriously interfered with plating.

This time, however, stainless steel is replacing many parts which have always been chromium plated. The grille, for example, is usually a zinc base die casting, chromium plated. New models will feature stainless steel with no plating of this part at all.

What will the platers do about it? The stainless steel manufacturers in their national advertising address those who make plated articles. Invitations are extended to investigate advantages of stainless steel over plating.

Shouldn't job shop platers get together and start some soliciting of their own? If they put their best foot forward, they should be able to get some of the business now in stainless steel.

Stainless steel has its place. *But so does plating.*

✝

Jack McGee

Jack McGee, a prominent member of the Detroit Branch, met his death on August 22 in a airplane crash near Raleigh, N. C.

He was born thirty-four years ago in Memphis, Tenn., and received his early training there and at the University of Detroit. At the time of his death he was Vice-President and Sales Manager of the Wyandotte Paint Products Company, Wyandotte, Mich.

Mr. McGee is survived by his wife, mother, sister and two brothers.

Edgar A. Hahn.

Platers—Know Your Metal Costs

In all too numerous instances, job shop plates have been faced with competition quoting as little as 1½ cents per pound for cadmium plating, according to the *National Association of Metal Finishers.* When confronted with a price, the tendency is to meet it, particularly if the good will of a large customer is involved.

A concrete example of the absolute stupidity of such a quotation is shown by the following:

A customer wishes a quotation on cadmium plating, 0.0002 inch thick, on square steel nuts ⅛″ thick x ⅜″ x ⅜″ with 10-24 threaded hole. The total surface area per nut is 0.551 square inch or 0.00383 square foot. There are 25,000 pieces per 100 pounds with 95.68 square feet of surface area.

One pound of cadmium, costing $1.80, covers 100 square feet when deposited to a thickness 0.0002 inch thick. Therefore, 100 pounds of these nuts require 0.957 pounds of cadmium at $1.72.

And that's only the cadmium cost!

This case simply brings to light how money can be lost by not checking all the elements of cost thoroughly, and it demonstrates the guesswork behind some of the ridiculously low cadmium quotations that have been encountered. Even at a selling price of four cents per pound, still referring to the above example, the cadmium cost is 43 per cent of the selling price. National averages have indicated a total cost of supplies (metal, acid, cleaner, etc.) to be 15 to 20 per cent which shows how far off a plater can be quoting four cents per pound, much less 1½ cents.

Second National Materials Handling Exposition To Be Held in Cleveland

The National Materials Handling Exposition will be conducted for the second year in the *Public Auditorium*, Cleveland, Ohio, January 12 to 16, inclusive.

One hundred and fifty-four exhibitors, an increase of 60 per cent, already have contracted for booth space. The exposition, which attracted more than 12,000 execu-

tives last January, will occupy almost 200,000 square feet of exhibit space, nearly three times the previous area.

The show will run for five days, instead of four, and all systems of materials handling will be on exhibition to make the showing completely representative.

Educational features will incoude a *Conference on Materials Handling*, which will be held concurrently with the exposition; a *Materials Handling Theatre*, which will present films on handling subjects, and an institutional presentation of materials handling equipment and systems in addition to those shown in the commercial exhibits.

Dr. Fink Honored

Dr. Colin G. Fink, Head of the Department of Electrochemistry of Columbia University, who recently resigned from the Secretaryship of the Electrochemical Society following many years of service, was honored at a Testimonial Dinner held on October 16 during the Society's Fall Meeting.

A. E. S. President Hutton wrote to Dr. Fink as follows:

DEAR DR. FINK:

On behalf of the Executive Board and the Membership of the American Electroplaters' Society, I wish to extend heartiest greetings at this testimonial dinner justly honoring a man who has served so faithfully and zealously over such a long period of years.

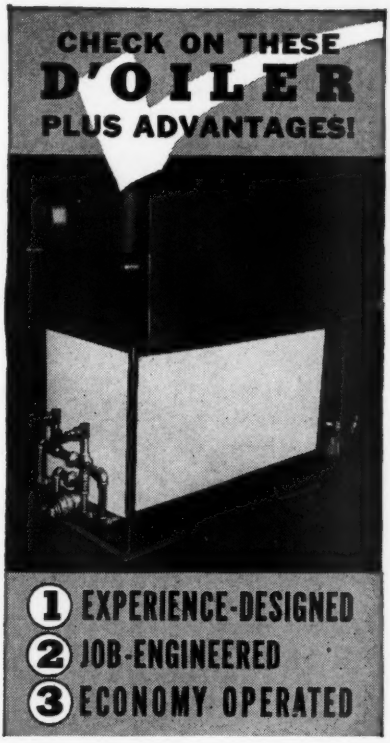
The large attendance at this dinner paying humble respect to a man who has fathered and nurtured the Society to its present size and standing as a technical society should leave you with a feeling that your efforts have been deeply appreciated.

We all know that giving up the Secretaryship in the Electrochemical Society does not mean that your active interest in this Society has changed a single iota.

With every good wish for many long, happy, healthful and active years still to come, I am

Most cordially yours,

KENNETH M. HUSTON,
President.



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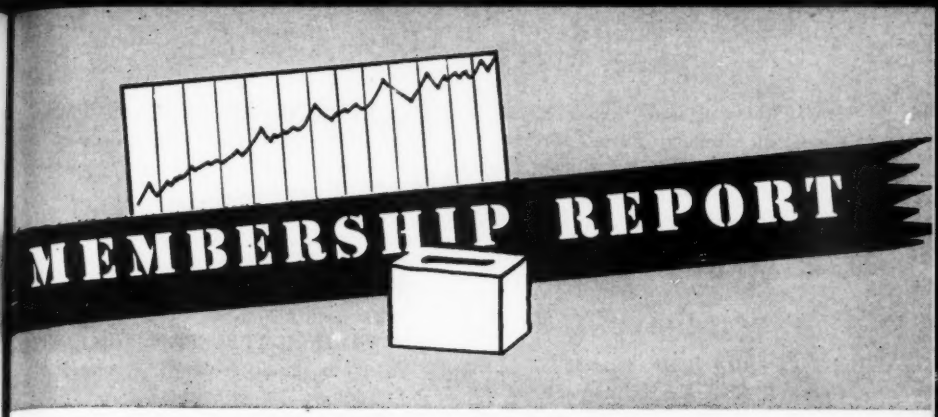


ARTHUR W. LOGOZZO
Chairman, Membership Committee

ELECTIONS

BOSTON BRANCH: Salvatore J. Bellissimo, Ernest D. Carr, Irving A. Carr, John W. Coulouris, Russell W. Cox, Lucia Doane, Arthur E. Durkin, Richard I. Furbush, Solomon J. Gootman, Albert J. Gordon, Frederick R. Grover, George A. Larchian, Maurice Milani, Oscar F. Pearson, Ralph A. Viafora, Emil F. Weiss, Jr., Monte J. Zopatti.

CHICAGO BRANCH: Eugene Gryglas, Donald M. Johnson, John P. Nix, H. S. Walkup.

CLEVELAND BRANCH: Wayne E. Blake, Ernest D. Otto, Andrew Takach, John Trembly

COLUMBUS BRANCH: Jack B. Smith, James C. Zelein

DETROIT BRANCH: Ed L. Dahmer, C. A. Falk, G. Jolliff, E. W. McAleer, J. J. McAleer, W. J. McCormick, O. H. Nix, R. S. Pearce, R. Richards, G. R. Smith, N. J. Smith, E. F. Soop, D. P. Waits

LOS ANGELES BRANCH: J. M. Beatty, M. J. Beal, Harold A. Claus, A. E. Clenard, Daniel M. Denton, Jr., Fred P. Geibel, J. D. Hudson, John S. Hunter, James D. Mason, Eugene Neal, Paul E. Pifer, C. R. Possell, Harold L. Preston, R. A. Richards, Roy M. Stutzman, C. B. White

MILWAUKEE BRANCH: Sam Audenby, G. Paul Beardsley, Gene E. Pielbusch

MONTREAL BRANCH: Roy C. Spooner

NEWARK BRANCH: Vincent Carney, Melain Dressen, Lester M. Glick, Anthony J. LaRocca, James F. O'Brien, James L. Sweet, Peter P. Vitarelli

PHILADELPHIA BRANCH: Rudolph Drop, Samuel L. Groff, John R. Patterson

PROVIDENCE-ATTLEBORO BRANCH: Charles E. Goyette, Hugh J. McGuinness. Richard I. Reid

ROCHESTER BRANCH: Benjamin Kiner, Robert C. McGlenn

ST. LOUIS BRANCH: Eric A. Epple, Norman H. Mantei, Seth A. Robins, Fred C. Schramm, Charles J. Wagner

SOUTHEASTERN BRANCH: Roy Carl Davis

SYDNEY BRANCH: W. E. Eastwood, J. L. Lawler, H. R. Townsend, R. Wilkins, A. Poole, G. C. Johnson

TORONTO BRANCH: R. J. Lavallee, Michael Nesbitt

WATERBURY BRANCH: William Gaunt

REINSTATEMENTS

DETROIT BRANCH: A. J. Johnson

INDIANAPOLIS BRANCH: H. B. Schoch, F. W. Whipple

CINCINNATI BRANCH: George Perkins, formerly a member of the Detroit Branch

ROCHESTER BRANCH: Judson Elster

ST. LOUIS BRANCH: Otto Reber, John F. Wright

SYDNEY BRANCH: T. O. Kolts

TRANSFERS

Fred L. Hintze from Bridgeport Branch to Newark Branch; Stuart Krentel from Chicago Branch to Los Angeles Branch;

L. D. Ridenour from Dayton Branch to Cincinnati Branch; Russell Rothe from Milwaukee Branch to Grand Rapids Branch; Arthur C. Pearson from Philadelphia Branch to Boston Branch; J. J. Duffy, Jr., from Rochester Branch to Philadelphia Branch

RESIGNATIONS

BOSTON BRANCH: Everett J. Baer, George F. Melanson
CLEVELAND BRANCH: John E. Schmotzer, Norman B. Dewees
DETROIT BRANCH: John J. Schultz
GRAND RAPIDS BRANCH: Donald J. Anders, Clifford W. Bielefeld
INDIANAPOLIS BRANCH: N. B. Schoch
LANCASTER BRANCH: John C. Mylin, Ira E. Rohm
PROVIDENCE-ATTLEBORO BRANCH: Leo LeBlanc
SAN FRANCISCO BRANCH: N. Phillips
TORONTO BRANCH: Joseph Grimley

SUSPENSIONS

BOSTON BRANCH: D. Madigan, John W. Ramsden
GRAND RAPIDS BRANCH: John B. Jakle, Jack Lehmoine
PROVIDENCE-ATTLEBORO BRANCH: Joseph Bardwell, James E. Shockroo, M. L. Taylor
SOUTHEASTERN BRANCH: Clarence Estes, Elmer Estes

DEATHS

CHICAGO BRANCH: Frank Novotny
CINCINNATI BRANCH: Stewart Chipman
DETROIT BRANCH: Jack McGee
NEWARK BRANCH: Vincent Pellegrino

Important Memo

Effective January 1948

THE MONTHLY REVIEW

will be called . . .

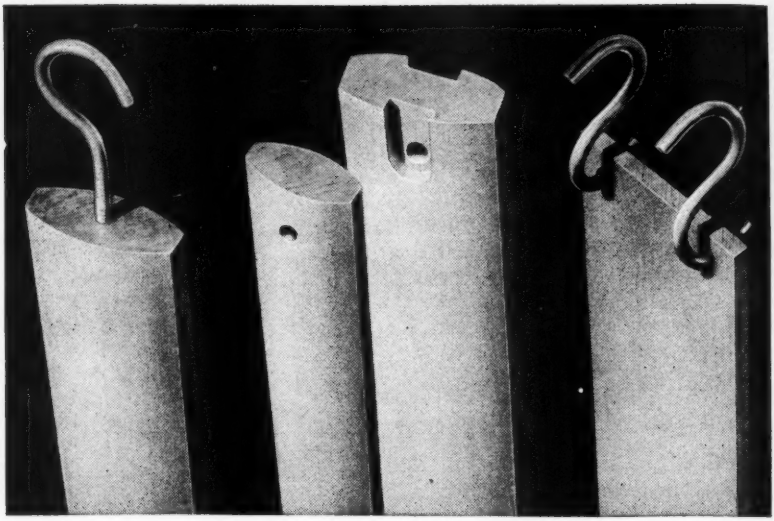
PLATING

THE SIZE WILL BE 8¼x11¼ BLEED—7x10 TYPE PAGE

MEMBERSHIP REPORT

BRANCH	Membership May 1, 1947	New Members	Net Change in Membership	Per Cent Net Change
FIRST GROUP				
LOS ANGELES	198	22	+20	+10.1
BOSTON	160	17	+13½	+ 8.4
CHICAGO	410	32	+25½	+ 6.3
CLEVELAND	192	13	+ 7	+ 3.6
BRIDGEPORT	147	10	+ 4½	+ 3.1
PHILADELPHIA	218	15	+ 4½	+ 2.1
GRAND RAPIDS	136	16	+ 2½	+ 1.8
TORONTO	144	5	+ 2½	+ 1.7
WATERBURY	139	2	+ 1	+ 0.7
HARTFORD	141	1	− ½	− 0.4
NEW YORK	259	7	− 5½	− 2.1
NEWARK	257	13	−10	− 3.9
DETROIT	423	24	−24½	− 5.8
SECOND GROUP				
ROCHESTER	88	5	+ 6	+ 6.8
NEW HAVEN	114	5	+ 7	+ 6.1
ST. JOSEPH VALLEY	88	6	+ 5	+ 5.7
ST. LOUIS	96	5	+ 5	+ 5.2
PITTSBURGH	126	10	+ 6½	+ 5.1
SAN FRANCISCO	77	4	+ 3½	+ 4.5
BUFFALO	98	3	+ 2½	+ 2.5
TWIN CITY	95	1	+ 1	+ 1.1
MILWAUKEE	124	6	+ 1	+ 0.8
BALTIMORE-WASH.	119	9	− 1	− 0.8
DAYTON	90	1	− 3	− 3.3
PROV. ATTLEBORO	126	9	− 5	− 4.0
INDIANAPOLIS	103	16	−11½	−11.3
THIRD GROUP				
ADELAIDE	49	14	+13	+26.5
SYDNEY	78	16	+12	+15.4
TOLEDO	55	4	+ 3	+ 5.5
SPRINGFIELD	73	4	+ 3	+ 4.1
COLUMBUS	35	6	+ ½	+ 1.4
SYRACUSE	73	..	+ ½	+ 0.7
SOUTHEASTERN	43	3	.....	.....
MELBOURNE	61	..	.....	.....
CINCINNATI	52	2	− ½	− 1.0
JACKSON-LANSING	49	..	− 1	− 2.0
LANCASTER	38	2	− 1	+ 2.6
ROCKFORD	64	4	− 2	− 3.1
MONTREAL	60	1	− 2	− 3.3
TOTAL A. E. S.	4,898	313	+85	+ 1.7

Membership, October 10, 1947 4,983



Anaconda means Purity in Copper Anodes

WHEN YOU SPECIFY ANACONDA, you are assured of unexcelled purity... less than 0.01 percent of total metallic impurities... an advantage that pays off five ways:

1. **Copper goes into solution faster and more uniformly.**
2. **The highest quality deposit is produced in the shortest possible time.**
3. **Slime is reduced to an absolute minimum.**
4. **Spotting and discoloration of the deposit are minimized.**
5. **Scrap losses are exceptionally low.**

In addition to copper, Anaconda Anodes are furnished in brass and bronze... rolled Sheet or Oval... cut to your own specifications or standard sizes... drilled or undrilled... with or without hooks—also "cathode-anodes." For present or future reference, write for Publication C-5. 47272

THE AMERICAN BRASS COMPANY

ANACONDA

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., *New Toronto, Ont.*

INDUSTRY NEWS

Davis Announces New Gas and Vapor Alarm System

Davis Emergency Equipment Company, Inc., 45 Halleck Street, Newark 4, N. J., manufacturers of gas detection equipment, announces new and outstanding developments in their *Continuous, Combustible Gas Alarm System* (Remote Head Type).

When vapor mixtures reach a preseclected percentage of the lower explosive limit, a series of relays close to sound an audible signal and to control appliances.

Machines can be shut down. Ventilation may be started or increased. Fire prevention systems can be actuated. In fact, any function may be performed which is made possible by opening and closing an electric circuit.

Improved Bright Cadmium Plating Process

Announcement is made by the *Hanson-Van Winkle-Munning Company*, Matawan, N. J., of a new and improved bright cadmium plating process, the result of two years of laboratory investigation and commercial testing in the field—the *Cadux HS Process.*

The advantages claimed for the new process are:

1. A remarkable increase in brightness of deposit
2. A higher tolerance for impurities
3. Higher permissible current densities
4. Improved covering power and appearance on rough and imperfect surfaces.

Under optimum conditions, the deposits are mirror-bright as they come from the plating solution. A short bright dip may be used in order to compensate for variations of current distribution because of limitations in racking or because of the intricate shape of the article being plated. It also minimizes finger marking during assembly operation.

One of the outstanding features of the Cadux HS Process is its tolerance for impurities. The range of the bath is from 20 to 40 amp/sq.ft. with an optimum current density of 30 to 35 amp/sq.ft. in still plating. With agitation, current densities up to 70 amp/sq.ft. have been employed.

Work on the covering power on rough base metal indicates that a lower grade steel may be used and still give a finished product which will pass inspection.

A new *Technical Instruction Manual* has been issued in which formulae are given for the preparation of both still and barrel solutions. The Cadux HS Process produces excellent results by either method. Existing solutions can be converted to Cadux HS by adding Cadux HS Conversion Salts and Concentrated Cadux HS Brightener along with the proper adjustment of metal and free cyanide concentration in the bath.

Skin Protection for Bright Metal Surfaces

Recently developed by *Dennis Chemical Company*, 2700 Papin Street, St. Louis, Mo., is a new, protective, liquid-plastic coating for polished or bright metal called "*Redskin.*" Coating is applied simply by spray, brush or dipping on bright metal surfaces. Dries quickly forming a tough, elastic film that is impervious to rust, chemical reaction, smears, or normal handling. Red color instantly warns against promiscuous rough

handling of bright or polished surface. When desiring to uncover bright surface, edge is picked up with finger nail and coating peeled off entire surface in one continuous strip. Parts protected with this new coating may be completely fabricated before removing protective "skin". Assembled items may be coated for storage or for protection in shipping. It is not affected by atmosphere or climatic changes. Manufacturer can make immediate delivery. Full information and sample upon request.

Cowles Detergent Company Conducts Metal Cleaning Clinic

The Cowles Detergent Company has just concluded a post-war refresher course for all members of the Metal Cleaning Department at the home offices and laboratories in Cleveland, Ohio, during which all phases of metal finishing and cleaning were discussed in detail.

Standing, from left to right, are: *Clarence Ozar*, Manager of the Metal Cleaner Service Laboratory; *Clyde Lowe; C. C. Bassett*, Vice-President and Director of Sales; *Gene Garman; E. F. Clark*, Manager of Metal Cleaner Department; *Charles Churchill, Harold Fulton.* Seated are: *Jack Dobson*; *M. P. Boland* of the Metal Cleaner Research Staff; and *F. H. Hitchcock. Dr. C. W. MacMullen*, Technical Director, also attended the clinic.

New Facilities for Michigan Buff

Modern, air-conditioned warehoue and office facilities have been acquired recently by the *Michigan Buff Company, Inc.*, of Detroit, Mich., according to an announcement by *Mr. A. W. Payson*, president. The company, founded in 1929, sells all items pertaining to polishing and buffing.

The new Detroit plant is located at 3503 Gaylord Avenue. The Michigan Buff Company also maintains an office and warehouse in Chicago.

New Belt Surfacer Announced by Production

A horizontal belt surfacing machine, available in two sizes, has been announced by the *Production Machine Company* of Greenfield, Mass. The larger size machine employs a 20-inch belt and has an operating surface of 20 by 30 inches for handling large work. The smaller machine uses a belt 14 inches wide.

The machine is operated at a standard belt surface speed of 4,600 feet per minute, and the abrasive belt may be either wet or dry. A feature of the surfacing machine is a recirculating system, with a centrifugal coolant pump mounted in a 32-gallon tank.

Further information on this horizontal surfacer will be furnished by the manufacturer upon request.

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PARAMOUNT BRAND

FELT WHEELS

Quality • Better Work • Uniformity

Order PARAMOUNT BRAND Felt Wheels from your supplier. Also, bobs and sheets whenever you need them.

BACON FELT CO. Winchester, Mass.
Established 1824
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Used Throughout the Plating Industry

Developed and Manufactured by Experienced Platers

MICCROLOID . . . . corrosive-resistant coating for metal, wood, concrete
MICCROLAC . . . . mirror-finish lacquer for decorative plated metals
MICCROTAPE . . . . extruded tape for plating racks and selective plating
MICCROTUBE . . . . extruded tubing to protect straight or bent contact wires
MICCROTEX . . . . synthetic air-dry rack coating for all plating cycles
MICCROPLASTIC . . . . heat-cured chemically-resistant rack coating—cuts costs
MICCROMASK . . . . for masking machined parts prior to hard chrome plating
MICCROSTOP . . . . stop-off lacquer for all selective plating cycles
MICCROSTRIP . . . . for easy removal of stop-off lacquers and rack coatings

Samples and descriptive literature of all Miccro Products will be sent upon request.

MICHIGAN CHROME
AND CHEMICAL COMPANY
6340 E. Jefferson Avenue, Detroit 7, Michigan

New Products for Industry Keynote Regional Oakite Technical-Sales Conference

How new products and methods in the field of industrial cleaning and allied procedures are helping to lower production costs is the theme of each of four regional technical-sales conferences held throughout the country from September through November, 1947, by *Oakite Products, Inc.*

The first conference was held on September 8 to 10 at the Palmer House, Chicago, Ill., with members of the Central, Chicago and Detroit divisions participating.

Among new Oakite products highlighted on these conferences' agenda are a new balanced cleaner that prepares brass and copper articles for high-luster bright plating and a self-emulsifying solvent for cleaning metal parts in spray-washing machines.

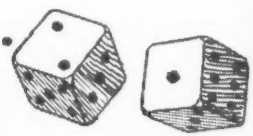
The second conference was held September 15 to 17 at the Coronado Hotel, St. Louis, Mo., for representatives of the Midwestern, Southern and Southwestern divisions. The New York, New England and Philadelphia divisions attended the third meeting at the Hotel Commodore in New York on October 6 to 8. The St. Francis Hotel, San Francisco, Calif., will be the scene of the fourth conference on November 17 and 18, in which members of the Pacific Coast divisions will participate.

Foxboro Valve Bulletin in New Edition

Pneumatic Control Valves and Controller Accessories, the 36-page *Bullein 277–2 of The Foxboro Company*, Foxboro, Mass., has just been issued in a new revised edition. Copies will be mailed on request.

Features of the new bulletin include: plates and tables of specifications for control valves, needle type valves, poppet valves and butterfly valves; separate sections on the Vernier Valvactor for high-accuracy positioning of valve plungers, and on air switches and sub-panels for remote valve control. Information is supplied on the

DON'T GAMBLE...



SPECIFY HARRISON 4A Buffing and Polishing COMPOUNDS-

AND *Be Sure!*

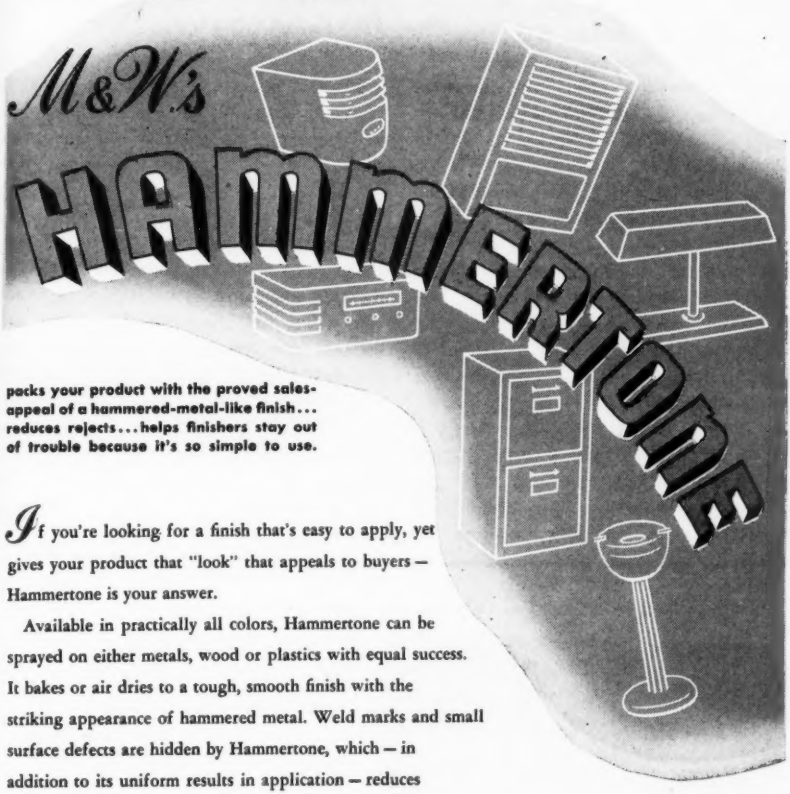
DOUBLE - HEADER
COMPOUNDS IN SIZES
150-180-220-240- 320

. . . Sure of the right compound for the right material. Sure, too, of the uniform, dependable quality built into every Harrison product for over 25 years.

For faster cutting, increased production, greater economy, specify Harrison 4-A Products. We will be glad to advise you on special problems and furnish samples of compounds that will meet your needs.

HARRISON & CO., INC. Dept. 1 **HAVERHILL, MASS.**

Sure Cure for Finishing Room Headaches...



packs your product with the proved sales-appeal of a hammered-metal-like finish... reduces rejects... helps finishers stay out of trouble because it's so simple to use.

If you're looking for a finish that's easy to apply, yet gives your product that "look" that appeals to buyers — Hammertone is your answer.

Available in practically all colors, Hammertone can be sprayed on either metals, wood or plastics with equal success. It bakes or air dries to a tough, smooth finish with the striking appearance of hammered metal. Weld marks and small surface defects are hidden by Hammertone, which — in addition to its uniform results in application — reduces rejects to a minimum.

For further information, write for Technical Bulletin #115 or ask your M&W representative. Color card is available.

PIONEERS IN PROTECTION
M&W Co. 1876

... where industry goes with finishing problems

MAAS & WALDSTEIN COMPANY NEWARK 4, NEW JERSEY

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PRODUCERS OF LACQUERS, ENAMELS, SYNTHETICS AND SPECIALIZED PRODUCTION FINISHES

computing of valve sizes, with tables and formulas for determining the size of the correct valve for a contemplated installation. Air filter sets, ventilating dampers, and other accessory equipment are illustrated and described.

New, Elastic Synthetic Builds up Extra-Thick Protective Coating

The development of a new synthetic coating, which can be built up to extra-heavy thicknesses, has been announced by *United Chromium, Incorporated.* Primarily designed to insulate and protect electroplating racks, it displays wide possibilities for numerous other products.

This material, marketed as *Unichrome Coating 218*, contains 100 per cent solids, with nothing to evaporate. It is a baking synthetic, applied by dipping or spraying, and upon curing at 350° F becomes a sleek, elastic coating. On some racks thicknesses up to ¼ inch can be achieved within two hours on areas where such a degree of protection is desirable. Coating 218 has been found to with stand mechanical abuses with out chipping, tearing or lifting from equipment to which applied.

Tests reveal it also withstands a broad variety of strong chemicals in addition to hot cleaning solutions and all plating baths.

For details, write to United Chromium, Incorporated, 51 East 42nd Street, New York 17, N. Y.

Belt Conveyor Cleaning Machine

Ease of operation and maintenance and ready accessibility for inspection, servicing, and repair are characteristic of the custom-made *Cincinnati Belt Conveyor, Wash, Double Rinse, and Dry Machine*, manufactured by *Cincinnati Cleaning and Finishing Machine Company*, Hecla Street, Ironton, Ohio. The centralized location of electrical starting equipment permits starting or stopping from one position. Throttling cocks on spray headers allow adjustment of spray pressure. Thermostatic control instruments maintain accurate solution temperature.

A dual set of removable screens permits cleaning without shutting down the machine. A pump of double bearing type assures trouble-free operation. Tanks are heated with gas.

CHROMIUM
NICKEL
COPPER

Simple test sets for aid in controlling plating and other solutions.

Write for literature.

KOCOUR CO.

4801 S. ST. LOUIS AVE.
CHICAGO 32, ILL.

Specify Kocour Sets from your supplier.

Gordon Spencer Opens New Nankervis Office

Mr. A. Gordon Spencer, who recently resigned his position as Chief Metallurgist of the Chevrolet-Flint Division of General Motors Corporation, has joined the *George L. Nankervis Company*, and opened its new Branch office at 303 Patterson Building, Flint 1, Mich.

Mr. Spencer will service the Saginaw Valley District.

New Duriron Bulletins

The *Duriron Company*, Dayton 1, Ohio, offers two new bulletins. One, "*Corrosion Resisting Process Equipment*", lists such items as anodes, coils, ejectors, exhaust fans, heaters and heat exchangers, steam jets, mixing and spray nozzles, pipes and fittings, pumps, and valves, together woth short descriptions and available sizes.

The other, *Bulletin 100*, "*Guide to Selection of Durco Corrosion Resisting Alloys*", presents an evaluation of the resistance of six alloys to seventy-one corrosive solutions.

Both contain a table of characteristics of he alloys.

Rubber Boots

A new catalog section on its line of industrial rubber footwear has just been published by *The B. F. Goodrich Company*, Akron, Ohio, and is now available upon request. The section describes construction of boots, rubbers, gaiters, work shoes and pacs and outlines their particular functions in industry.

ZINC PLATERS!

Cleanse & Purify your Zinc Solution with

McKeon's

Zinc-Brite

TRADE MARK REG'D.

Make your Zinc Bright

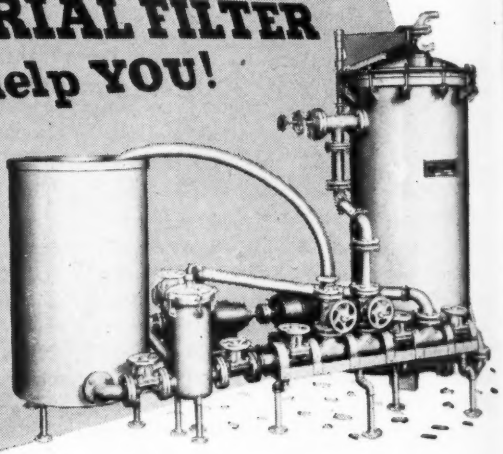
Information free— wire collect

Sulphur Products Co. Inc.

Greensburg 9, Pa.

A modern INDUSTRIAL FILTER will help YOU!

- Cut your plating costs
- Speed up production
- Produce quality plating
- Eliminate numerous plating troubles



Only CLEAN plating solutions can produce clean, non-porous plated coatings. The low cost for clarifying plating solutions with INDUSTRIAL FILTERS is really a saving as rejects are reduced and quality is greatly improved. Continuous clarification (filtering) also creates a beneficial circulation.

Illustration of a typical large capacity complete stationary filter system designed to provide adequate filtration on large automatic plating machines. Arrangement consists of filter, pumping unit, primer-strainer unit, mixing tank, control valves, fittings and piping. These features facilitate the convenient use of filter aids and purifying agents, making it an ideal continuous filtration system, equally effective for intermittent filtering. Systems are provided for either acid or alkaline solutions.

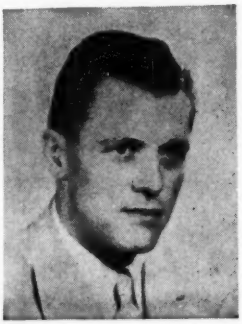
FOR TWENTY YEARS "INDUSTRIAL" HAS BEEN BUILDING PLATING SOLUTION FILTERS THAT HAVE ENJOYED AN OUTSTANDING REPUTATION FOR: RUGGEDNESS, DEPENDABILITY, LOW UPKEEP COST, LONG LIFE AND BED ROCK OPERATING ECONOMY. THAT'S WHY SO MANY PLATERS SAY: I PREFER THE "INDUSTRIAL" WAY.

INDUSTRIAL
FILTER & PUMP MFG. CO.

1621-39 WEST CARROLL AVENUE • CHICAGO 12, ILLINOIS

Michigan Chrome Appoints Mid-West Representative

King Ruhly has been appointed mid-west sales representative by *Michigan Chrome*



and Chemical Company, 6340 E. Jefferson Avenue, Detroit 7, Mich. Mr. Ruhly will represent the complete line of *Miccro Products*—rack coatings, stop-off lacquers and corrosive resistants for the plating industry—in Indiana, Illinois, Wisconsin, Missouri, Iowa and Minnesota.

Mr. Ruhly was graduated with honors from Wayne University, Detroit, in 1939. He continued study for his Master's degree while serving as principal and teacher at Franklin School, Franklin, Mich. After a brief period in the personnel department of Vicker's, Inc., Detroit, he enlisted in the Navy from which he was discharged as Lieutenant (jg) in 1946.

Westinghouse Announces New Sturtevant Axiflo Fans

A new line of axial flow pressure fans has been announced by the *Sturtevant Division* of the *Westinghouse Electric Corporation.*

Two basic types of these *Axiflo* fans are available: the straight-through type and the convertible elbow type, both furnished with either the three bladed aluminum alloy wheel or eight bladed steel wheel. Applications for these fans include: air conditioning, dust and fume removal, machinery cooling, mechanical draft for combustion, industrial drying and processing.

Designed for either vertical or horizontal operation, these Axiflo Pressure Fans are compact in design and sturdy in construction, require less space and have low weight, high efficiency, straight air flow,

All One Price

ONE SOLVENT FOR ALL METALS OR COMBINATION OF METALS

NEW SCIENTIFICALLY IMPROVED
BLACOSOLV
for SOLVENT VAPOR DEGREASERS

Write today for FREE BOOKLET ON Degreasers and application with Blacosolv.

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BLACOSOLV DEGREASERS AND SOLVENT

NIAGARA METAL PARTS WASHERS

G. S. BLAKESLEE CO., CHICAGO 50, ILLINOIS · New York, N. Y. · Toronto, Ont.

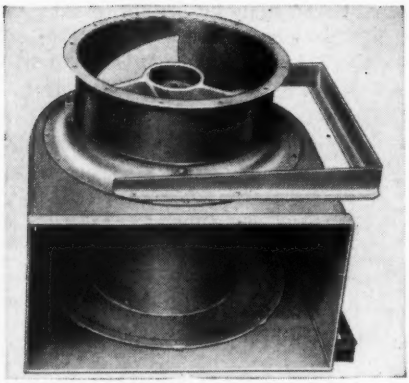


Fig. 1. The new Axiflo fan, design 2AE, with 3 bladed aluminum alloy wheel

and simplified mounting. The convertible elbow type with motor, belt and bearings located outside the air stream, readily accessible for inspection and maintenance, is ideal for high temperature service.

Sizes vary from 18 to 72 inches; static pressure from 0 to 3 inches, and displacement from 2,000 to 115,000 cfm.

Further information may be secured from the Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Mass.

Corrosion Resistant Materials

Bulletin K (16 pages) of the *U. S. Stoneware Company*, 120 Tallmadge Circle, Akron 9, Ohio, was prepared with a view to help in the selection of proper or suitable corrosion resistant materials and equipment for a wide array of industrial uses. Included are such products as acid brick and pumps, chemical porcelain and stoneware, drum rollers and tumblers, gasketing, jar mills, laboratory equipment, pipe and fittings, protective coatings, tank linings, tower packings, valves, and numerous others. All are pictured and briefly described.

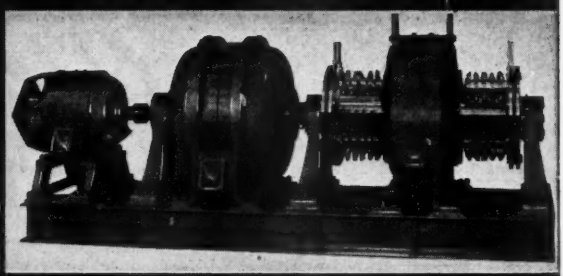
Chain Conveyor Bulletin

The *Island Equipment Corporation* of 101 Park Avenue, New York 17, N. Y., has just issued a 16-page bulletin, *P-C18-1A-1*, on *Ultimate Double-Flex Chain Conveyor* for the economical and prompt handling of cases, cartons, boxes and cans.

It is filled with diagrams, floor plans, layouts, installation views, and detailed construction of the system.

A copy will be sent to anyone interested who requests it on his company's stationery.

COLUMBIA MOTOR GENERATORS



FOR ELECTRO-PLATING

Columbia Generators embody every feature essential for dependable, 24-hour operation. They are built for electro-plating service in sizes of 6 to 20 volts, 500 to 20,000 amperes, for anodic treatment of aluminum in sizes of 40, 50, and 60 volts, 500 to 3,000 amperes. Columbia Generators for other electrolytic processes range from ½ to 250 KW, 100 to 40,000 amperes, 6 to 60 volts. Write for full information.

COLUMBIA ELECTRIC MFG. CO.

4519 HAMILTON AVE., N.E. CLEVELAND 14, OHIO

YOU know what you want in a rack coating: ease of application, long life with a minimum of re-coating, resistance to treeing, resistance to salt accumulation, and certainty that nothing in the coating will contaminate your solutions.

Well, U. S. Stoneware's Rack Coating 266 fills the bill. *Ease of Application:* An air dry dip coating that requires only 3-4 dips to build up a thickness of 1/16". *Long Life:* Electroplaters tell us that Coating 266 is standing up longer than any coating they have ever used. *Resistance to Treeing:* The basic resins used in Coating 266 have even greater electrical resistivity than the best rubber. *Resistance to Salts Accumulation:* The smooth, hard-to-wet, non-porous surface of Coating 266 refuses to let salts accumulation get started. *Freedom from Contamination:* Coating 266 is made from Tygon plastics whose non-toxic, inert properties have made it popular in laboratories, hospitals, food and beverage plants.

If you aren't using Coating 266 place a trial order with your dealer today. You'll like it.

U. S. STONEWARE
Akron 9, Ohio

Robert J. Peck Appointed Electric Products New York Manager

Mr. Gordon J. Berry, Vice-President of *The Electric Products Company*, has announced the appointment as of October 1 of

Robert J. Peck as District Manager of the company's New York office, 126 Liberty Street, New York City.

Mr. Peck handles all sales and service in the territory which consists of the New England States, Eastern New York and Pennsylvania, New Jersey, Delaware, Maryland and Virginia.

A graduate of New York University in 1930, Mr. Peck has since then been actively engaged in the selling, engineering and servicing of electrical products, He joined Electric Products in May, 1947.

H-VM-M Field Force Changes

The *Hanson-Van Winkle-Munning Company*, Matawan, N. J., announces the transfer, as of October 1, of *Arthur C. Pearson* from the Philadelphia office to New England, where he is associated with *Frank J. Clark* in covering Massachusetts and nearby territory.

Howard L. Wright was transferred as of October 1 from the New York State territory to Philadelphia.

Hot Process Water Softener

The essential function of a hot process water conditioning system is explained and

PLATERS

THE FOLLOWING EXCELLENT REBUILT AND GUARANTEED ELECTROPLATING MOTOR GENERATOR SETS, WITH FULL CONTROL EQUIPMENT, AT REDUCED PRICES:

1—15,000/7500 AMPERE, 6/12 VOLT, **COLUMBIA ELECTRIC COMPANY,** Latest Design Unit with Separate M. G. Exciter.
2—5000/2500 AMPERE, 9/18 VOLT, **CHARLES F. L'HOMMEDIEU** "RELIANCE" Units. Synchronous Motor Drive Latest Design.
1—5000/2500 AMPERE, 6/12 VOLT, **A. P. MUNNING COMPANY** "OPTIMUS" Design, Separately Excited.
1—4000/2000 AMPERE, 6/12 VOLT, **HANSON & VAN WINKLE COMPANY,** Compound Wound, Separately Excited.
1—2500/1250 AMPERE, 6/12 VOLT, **HANSON & VAN WINKLE COMPANY,** Shunt Wound, Separately Excited.
1—2000/1000 AMPERE, 10/20 VOLT, **COLUMBIA ELECTRIC COMPANY,** 25° Unit, with Synchronous Motor Drive.
1—2000/1000 AMPERE, 6/12 VOLT, **HANSON-MUNNING,** 40° Unit. Interpole Design, Separately Excited.
1—1500/750 AMPERE, 6/12 VOLT, **ELECTRIC PRODUCTS COMPANY,** Separately Excited, Ball-bearing design.
1—1500/750 AMPERE, 12/24 VOLT, **CHANDEYSSON ELECTRIC CO.** Unit. Synchronous Motor Drive. Direct Connected Exciter.
4—1000/500 AMPERE, 6/12 VOLT, **CHARLES J. BOGUE ELECTRIC CO.** Separately Excited, Interpole Design.
1—1500 AMPERE, 40 VOLT, **HANSON-MUNNING,** Anodizing Synch. M. G. Set, Automatic Controls.
1—1000 AMPERE, 40 VOLT, **CHANDEYSSON,** Anodizing Synch. M. G. Set, Automatic Controls.
1—1000 AMPERE, 25 VOLT, **HANSON-VAN WINKLE-MUNNING COMPANY,** Separately Excited —Anodizing Unit.
OTHER SIZES OF ANODIZING M. G. SETS—in stock for Sulphuric or Chromic Acid Solutions—large selection. Write for details.
10—**G. E.** COPPER OXIDE RECTIFIERS, 500 AMPERE, 6 VOLT, for operation on 220/3/60.
1—**G. E.** COPPER OXIDE RECTIFIER, 2000/1000 AMPERE, 6/12 VOLT, with control; for 220/3/60.
ALSO NEW SELENIUM RECTIFIERS AS LOW AS $90.00.

M. E. BAKER COMPANY 143 SIDNEY STREET CAMBRIDGE, MASS.

GEARED TO THE NEEDS OF INDUSTRY

when it's basic chemicals

... call on GENERAL CHEMICAL first!

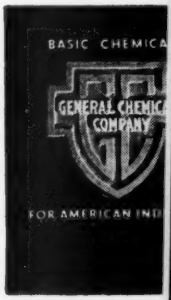
The General Chemical Company Sales and Technical Service organization works shoulder to shoulder with Industry . . . constantly alert to changing chemical demands in every field. Closely coordinated with it are the Company's progressive research program, and extensive—yet extremely adaptable—production facilities.

This way, General Chemical products are always geared to the needs of Industry . . . their grades and strengths meeting the most exacting requirements of the day. From such closely meshed efforts are coming General Chemical's new organic and inorganic chemicals for the process industries of tomorrow. The past stands proof that these, too, will be equally essential "Basic Chemicals for American Industry."

GENERAL CHEMICAL COMPANY
40 Rector Street, New York 6, N. Y.

Sales and Technical Service Offices: Albany • Atlanta • Baltimore • Birmingham Boston • Bridgeport • Buffalo • Charlotte • Chicago • Cleveland • Denver Detroit • Houston • Kansas City • Los Angeles • Minneapolis • New York Philadelphia • Pittsburgh • Portland (Ore.) • Providence • San Francisco Seattle • St. Louis • Wenatchee • Yakima (Wash.)

In Wisconsin: General Chemical Wisconsin Corporation, Milwaukee, Wis.
In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver



For Sale

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Slightly Used
BUFFS

LOOSE & SEWED
ANY QUANTITY
ALL SIZES

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Michigan Buff Co., Inc.
3503 GAYLORD AVENUE
DETROIT 12, MICHIGAN

PERMAG

Prepares the metal surface for a perfect finish

Electroplaters find PERMAG Compounds produce a chemically clean surface in quicker time.

PERMAG Compounds are economical to use: they never injure soft metal surfaces.

Let us send details

Magnuson Products Corp.
50 Court St. Brooklyn 2,, N. Y.
In Canada: Canadian PERMAG Products Ltd.
Montreal, Toronto

diagramed in new 12-page bulletin *No. 28B6611* offered by *Allis-Chalmers Manufacturing Company*, Milwaukee 1, Wis. Included is a description of the equipment and an explanation of what it is designed to do, together with the mechanism of its operation.

Grinding and Polishing

Sixteen-page booklet entitled *Step Up Production* features the *3M Backstand Method* of the *Minnesota Mining and Manufacturing Company*, 900 Fauquier Avenue, St. Paul 6, Minn. It contains among other data nine photographic case histories of plants which, it is claimed, were able to cut grinding and finishing time all the way from 30 to 80 per cent by adopting this method.

New Acme Liquid Coloring Composition

The *Hanson-Van Winkle-Munning Company*, Matawan, N. J., announces the development of a new liquid coloring composition for coloring nickel, brass, copper, aluminum and zinc die castings. The product, which is known as *Acme Grade 4-L-10*, is recommended for use with pressure type composition spray equipment. It is said to clean up beautifully on the work, leave the face of the buff soft and clear, and not to clog fluid lines.

Parts Cleaning Unit Uses Cold Solvent

Gray-Mills Corporation, 1948 Ridge Avenue, Evanston, Ill., is the manufacturer of *Model H-83 "Agitor"* Parts Cleaning System which measures 21 inches square, is 34 inches high, and has a sovent capacity of 24 gallons. Air-agitation and high volume hose cleaning are combined for two-way utility. An improved high volume centrifugal pumping unit for flowing out recesses and removing softened grease, or for brush-cleaning the parts under flowing solvent is provided. It uses cold solvent. No heating is necessary.

A work shelf accommodates parts being cleaned; this shelf slides out of the way to make the entire tank area available for soaking larger parts under air-agitation. Mounted on revolving casters, the unit is portable.

Start with a *Good Finish*

Cleaning Compounds formulated by The Puritan Manufacturing Company provide platers with the necessary requirements for satisfactory plating. PURICO Compounds eliminate superfluous operations . . . save time and labor . . . minimize rejections . . . speeds up production.

Wonderbar

A pre-saponified Tripoli bar composition for economical buffing. Soluble in mild alkali, Wonderbar rinses from intricate patterns without requiring degreasing machines. *Makes tedious manual scrubbing unnecessary.*

Pur-Bur

Solves the tough and complex burring problem. Applied to the wheel, Pur-Bur is self-lubricating to prevent friction, embrittlement, or burned surfaces. Possesses high cutting qualities for rapid removal of burrs and fins without dangerous results.

Purico ZN

A black oxide finish that provides a lustrous black, long-lasting finish on Zinc products. Penetrates directly into the metal to eliminate the danger of chipping or flaking.

THE *Puritan*
MANUFACTURING COMPANY
WATERBURY, CONNECTICUT

"YANKEE BRAND"

PROGRESSIVELY BETTER
ABRASIVE COMPOUNDS

Tailored to fit all
finishing requirements.

Inquiries respectfully solicited

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(est. 1919)
Manufacturers
BUFFING COMPOSITIONS
FOUNDRY FACINGS
900 Housatonic Ave., Bridgeport, Conn.
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Zialite

Reg. U. S. Pat. Off.

For NICKEL PLATING

The one bath especially designed for plating WHITE METAL ALLOYS including ZINC, LEAD and ALUMINUM.

FOR
HARD CHROMIUM
USE
Zialite
ADDITION AGENTS

Send a sample of your present bath to see if it is suitable for conversion to this improved formula.

ZIALITE CORPORATION
92 Grove Street
Worcester 5, Mass.

Charles Wise Heads Buckeye Polishing and Buffing Division

The *Buckeye Products Company*, manufacturers of *Speedie Buffing* and *Polishing Compositions* and foundry supplies and equipment, announces that *Charles Wise*, Secretary, has been placed in charge of the Speedie Buffing and Polishing Composition Division of the company. Wise will be in charge of both manufacturing and sales activities. He has been associated with the Buckeye Products Company since 1928.

The Buckeye Products Company is now engaged in a program of extensive plant enlargement and modernization to take care of increased manufacturing demands.

Musick Company Polisher Honored

B. C. Wright, foreman polisher at *Musick Plating, Inc.*, St. Louis, Mo., recently celebrated sixty years of service with the Company at a banquet given in his honor and attended by his fellow employees.

He was presented with a gold plaque as a tribute to his record of long and faithful service. Now seventy-eight years of age, Mr. Wright looks forward to several more years with Musick.

Almost incredible is Mr. Wright's record of only eighteen working days missed in sixty years.

Fabrication of Nickeloid Metals

Those engaged in the metal fabricating field will be interested in *N-M Fabrication*

Automatic plating power units

Packaged for increased plating efficiency

• Here is the modern way to achieve continuous, uniform plating operations. General Electric "packaged" power units are flexible, and bring automatic control of tank voltage to the plating room.

Take a look at the features of a typical General Electric plating package:

1. A General Electric "2000" copper-oxide plating rectifier provides efficient, dependable power.

2. Automatic induction-type, motor-operated rectifier control provides smooth, steady voltage at the tank.

3. Operator's control box governs all operations, and can be located wherever it is most convenient for the user.

Wrap them all up, and you have a combination that *automatically* maintains constant tank voltage from "no load" to "full load" within ± 2 per cent of selected reading at all times.

In addition, use of the General Electric "2000" rectifier gives you complete flexibility to meet changing production needs. The General Electric "2000" is available in a number of different output ratings, for example: one model provides 3 to 6 volts, 2000 amperes, or 6 to 12 volts, 1000 amperes; another model is rated 4.5 to 9 volts, 1250 amperes, or 9 to 18 volts for 625 amperes.

We'd like to tell you more about the cost-saving features of packaged plating power. If you would like a copy of our comprehensive catalog, *General Electric Copper-oxide Rectifiers and Controls,* Write to Section A65-1158, Appliance and Merchandise Department, General Electric Company, Bridgeport 2, Connecticut.

GENERAL ELECTRIC

FOR SALE

Stevens Automatic Plating Machine. Model A. 1 generator, 6/12 Volts, 3,000 Amps.; 2 generators, 6/12 Volts, 1,500 Amps. Main rubber plating tank, 42" long, 53" wide, 44" deep. Plating solution cap. 5,050 gals. Machine completely set up for brass or nickel operation. New condition. All controls, indicating instruments, pumps, blowers and dryer. Immediate delivery.

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Custom-Built
TANKS
For Cleaning, Pickling and Plating

● For 39 years leading manufacturers have relied on Kirk & Blum for custom-built tanks to meet their individual production requirements.

We are equipped to fabricate tanks of Steel, Lead or Rubber Lined, Monel Metal, Stainless Steel, Copper, Aluminum, Inconel, etc.

Tanks are supplied with or without exhaust ducts and fans as conditions or specifications indicate.

KIRK AND BLUM
The KIRK & BLUM Mfg. Co.
2887 Spring Grove Ave.
Cincinnati 25, Ohio

Handbook, a 16-page booklet describing methods of bending, blanking, drawing, etching, forming, riveting, seaming, soldering, and welding prefinished metals manufactured by the *American Nickeloid Company*, Peru, Ill.

The booklet, which also includes lists of forms, sizes, gauges, and applications, may be had by writing to the manufacturer.

Literature on Polishing

E. Reed Burns Manufacturing Corporation, 40-42 Withers Street, Brooklyn 11, N. Y., offers the interested reader copies of its new leaflets on *Erbco Canvas Polishing Wheels*, *Aluminite Paste* for polishing stainless metals, *Emerite*, an emery paste, *Steelshine* for stainless steels and carbon steels, *Tripolex Compositions*, and *Burnsrouges*.

New Midget Barrel Plater

Wico Metal Products Company, 23142 Sherwood Avenue, Van Dyke, Mich., is showing a new *midget barrel-plater*. (Small parts are usually placed in metal barrels, perforated to allow solution to get through, then rotated while the current flows.) The midget barrel-plater is fitted with a self-contained drive, with the motor, transmission, belt-drive, and barrel one unit. Thus it can be hoisted easily and placed into the desired tank of solution or water, a switch snapped, and the barrel rotated. The barrel has no cover—it operates on scoop action. When the motor is reversed, the scoop serves as the outlet for dumping parts.

Plating, Polishing and Buffing Catalog

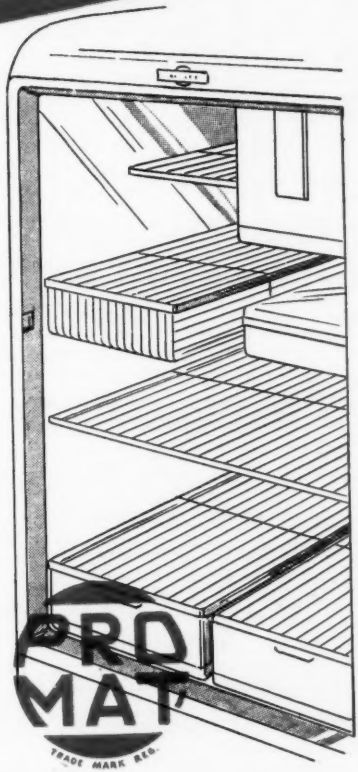
Frederic B. Stevens, Inc., of Detroit, Mich., has started distribution of its new *No. 30 General Catalog*, containing more than 600 pages. It is said to be the most complete and up-to-the-minute compilation of finishing information ever printed in one volume.

The book is much more than a catalog of quipment and supplies. It is in fact ar everitable Metal Finishing Encyclopedia, fo within its pages is an accumulation of information pertinent to modern metal finishing practice—all compiled as a distinct service to metal finishers.

A POST-WAR DECORATIVE PROTECTIVE FINISH

Pro-Seal

"TRADE MARK"
Reg. U. S. Pat. Off.



PRO-SEAL on ZINC PLATE brings up a grand Brilliance—inhibits and prevents white corrosion particles from forming for a considerably long period of time. While zinc is an ideal rust preventative—is cheap and easily applied electrolytically, its use has been limited for parts visible in final assembly because of dull and "dusty" corrosion products.

An adequate Zinc Plate plus Promat (non-electric) PRO-SEAL protects against RUST and makes any steel part LUSTROUS, BRIGHT and ATTRACTIVE.

PRO-SEAL is now specified and used to treat Zinc Plated Steel Refrigerator Shelves for a MAJORITY of domestic refrigerator manufacturers.

Hardware, automotive parts and hundreds of other fields can use PRO-SEAL to great advantage.

Representatives in principal cities. Write to

PROMAT DIVISION—Poor & Company
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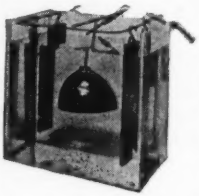
HIGH TEMPERATURE LUCITE PLATING TANKS for LABORATORY and PRODUCTION PLATING



Singleton tanks are made of high temperature Lucite to give unlimited life, resistance to all aqueous acids with no contamination even when changing from one bath to another, ruggedness, heat and electrical insulation, and transparency.

SEE THE BATH IN ACTION!

Our Singleton Production Tank, a Lucite tank within a steel tank, is the ideal, permanent answer to your plating problems at no higher cost.

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Buffing Compositions

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New H-VM-M Bulletins

Sisalin Sections—a combined buffing and polishing wheel, said to be the fastest and best cutting medium for preparing steel surfaces for nickel and chromium plating. *Bulletin SS-100.*

Polishing Wheels and Accessory Products. Wheels for all metals, made of cotton, canvas, bullneck leather, walrus leather, cemented sheepskin, quilted sheepskin, felt and leather covered wood; automatic electric glue heaters, improved balancing ways mandrels, and emery troughs.

These Bulletins can be obtained by writing to the *Hanson-Van Winkle-Munning Company,* Matawan, N. J.

1948 Chicago Production Show

Plans for the *1948 Chicago Production Show* of March 22, 23, and 24 at the Stevens Hotel and of the concurrent *Chicago Technical Conference* have now been announced. These twin events are an outgrowth of the *War Production Clinics* inaugurated in 1943.

Attended largely by production executives of Chicago and the Middle West, the Chicago Production Show is an annual exhibit of materials, tools, instruments, handling equipment, and services designed to increase production volume and decrease production costs.

Firms desiring to participate may direct their inquiries to *Mr. Paul A. Jenkins, Chicago Technical Societies Council,* 53 W. Jackson Boulevard, Chicago 4, Ill.

N.A.M.F. Elects New Board Members

Announcement is made of the election of new members of the *Board of Directors of the National Association of Metal Finishers, Inc.,* as follows:

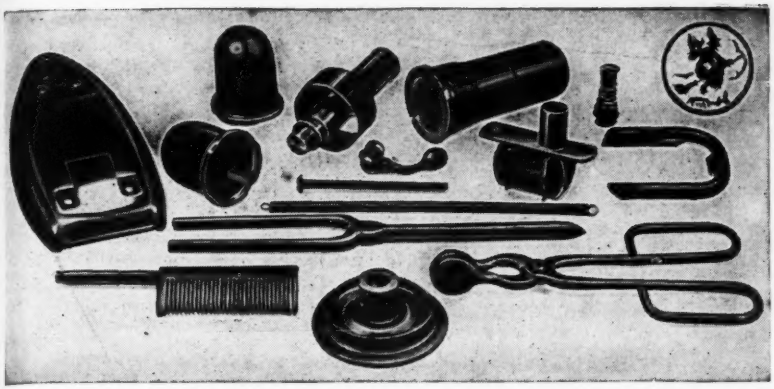
D. J. Griffin, Birmingham Plating Works, 937 N. 17th Street, Birmingham 4, Ala.

John Hilfinger, Hilfinger Corporation, 1800 Westwood Avenue, Toledo 7, Ohio

Charles W. Logan, Logan Platers, Inc., 555 Main Street, No. Tonowanda, N. Y.

Albert W. Olson, Industrial Plating Works, Inc., 3674 Fourth Avenue, South, Seattle, Wash.

F. A. Truden, Southern Finishers, Inc., 1000 Sixth Avenue, South, Nashville, Tenn.



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This single-bath process is easy to install. It is simple to work. Chemical reaction occurs at 300° F.

BLACK-MAGIC gives all steels except stainless a rich, durable black. It isn't a coating; it penetrates to .0001". Tough, flexible, it permits forming after processing. Also a fine bond for paints and lacquers. There are other BLACK-MAGIC baths for copper, brass, zinc, cadmium. Send for samples and the "Black Book" of information.

SILCO a glass-base, sprayed-on and beautifying finish for steel and brass products. In all colors. Write for samples.

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WITCH-DIP & WITCH-OIL FINAL FINISHES

SILCO *Glass-Base* PROTECTIVE COATING
HEAT TREATING SALTS, CLEANERS, ETC.

NEW JERSEY: Lacquer Finishing Co., Inc., Clifton, N. J.—C. D. Hamilton, Fayetteville, N.Y.—CLEVELAND: Universal Paint & Varnish Co.—DETROIT: The Danell Co.—MILWAUKEE: A. B. Plating Co.—PHILA.: Albert Printz, Germantown—ST. LOUIS: G. S. Robins & Co.—DALLAS, Tex: Texokana Supply Co.—LOS ANGELES: Barber-Webb Co.—OAKLAND: Geo. A. Kushman Co.

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Second Vice-President.....ARTHUR W. LOGOZZO
Nutmeg Chrome Corporation, 79 Chapel St., Hartford 3, Conn.

Third Vice-President.....WILLLAM. J. NEILL
Columbus Metal Products Inc., 767 W. 4th St., Columbus 8, Ohio

Past President.....F. K. SAVAGE
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Executive Secretary.....A. K. GRAHAM
P. O. Box 168, Jenkintown, Pa.

ADELAIDE AUSTRALIA. Acting Secretary, G. N. Dixon . G. P. O. Box 428D, Adelaide, Australia.

BALTIMORE-WASHINGTON meets first Tuesday of each month in October, December, February and April at the National Bureau of Standards, Washington, D C, and in November, January, March and May at American Hammered Piston Ring Company, Baltimore, Md. Secretary, Grace Riddell, Chemistry Division, National Bureau of Standards, Washington 25, D C.

BOSTON meets first Thursday of each month in Hotel Statler, Boston, Mass. Secretary, Dr. George P. Swift, 53 Galen Street, Watertown 72, Mass.

BRIDGEPORT meets first and third Friday of each month in Barnum Hotel. Secretary-Treasurer, Joseph G. Sterling, 134 Colony Street, Pridgeport 8, Conn.

BUFFALO meets second Friday of each month in Markeen Hotel, Buffalo, N. Y. Secretary, H. A. Fodeman, 534 W. Ferry Street, Buffalo 13, N. Y.

CHICAGO meets second Friday of each month at 8 P. M., in Atlantic Hotel. Secy-Treas., J. M. Andrus, 3701 Ravenswood Ave., Chicago 13, Ill.

CINCINNATI meets on fourth Wednesday of each month at 8 P. M., in Engineering Society Headquarters, McMillan Street and Woodburn Avenue, Cincinnati Ohio. Secretary-Treasurer, L. M. Rasmussen, 3228 Brotherton Rd., Cincinnati 9, Ohio.

CLEVELAND meets first Friday of each month in Cleveland Hotel, at 8 P. M. Secretary-Treasurer, George B. Svenson, 2059 Hamilton Avenue, Cleveland 14, Ohio.

COLUMBUS meets first Friday of each month in Battelle Memorial Institute Auditorium, 505 King Avenue, Columbus 1, Ohio, at 8 P. M. Sec'y-Treas., Bernard Agruss, 505 King Ave., Columbus 1, Ohio

DAYTON meets second Friday of each month in Engineers' Club, Dayton, Ohio. Secretary Treasurer, Elmar W. Rehme, 505 Commercial Bldg., Dayton 1, Ohio.

DETROIT meets first Friday of each month in , Hotel Statler. Secretary-Treasurer, F. L. Clifton, 16536 Inverness, Detroit 21, Mich.

GRAND RAPIDS meets second Friday of each month, 7:30 P. M., in Rowe Hotel. Secretary, Jacob M. Hage, 1327 Jefferson Ave., S. E. Grand Rapids, Mich.

HARTFORD meets third Monday of each month in Hotel Bond, Hartford, Conn. Secretary, A. J. Dankevich, 63 Massachussetts Ave., New Britain, Conn.

INDIANAPOLIS meets first Wednesday of each month at Fox Steak House, 1207 Washington Street. Secretary-Treasurer, James J. Monagle, 1464 W. Colorado Ave., Indianapolis, 1, Ind.

JACKSON-LANSING meets second Tuesday of each month at Home Dairy Company in Lansing. Secretary-Treasurer, U. J. Forsyth, 1816 Ada Street, Lansing 10, Mich.

LANCASTER meets second Friday of each month, at 8 P. M., in Thaddeus Stevens Industrial School, Lancaster, Pa. Secretary-Treasurer, H. Clay Brubaker, 881 Manor Street, Lancaster, Pa.

LOS ANGELES meets second Monday of each month at 6:30 P. M. Secretary, Dean D. Williams, 2728 W. 42nd Street, Los Angeles, Calif 2728 W. 42nd St., Los Angeles 43, Calif.

MELBOURNE, AUSTRALIA. Secretary, L. A. Francis, G. P. O. Box 4502.

MILWAUKEE meets first Friday of each month in Red Arrow Club, 774 N. Broadway. Secretary-Treasurer, James Durnford, 2370 N. 32nd Street, Milwaukee 10, Wis.

MONTREAL meets first Tuesday of each month in Mount Royal Hotel, Montreal, Quebec, Canada. Secretary-Treasurer, William L. Glover, 754 Second Avenue, Verdun 19, Quebec, Canada.

NEWARK meets first and third Friday of each month in Hotel Robert Treat, Newark, N. J., at 8 P. M. Secretary-Treasurer, George Wagner, 1130 S. Long Avenue, Hillside, N. J.

NEW HAVEN meets second Tuesday of each month alternating between Sterling Chemistry Laboratory, Yale University, and Hotel Taft. Secretary-Treasurer, B. J. Gaffney, 40 Filbert Street, Spring Glen, Hamden 14, Conn.

NEW YORK meets second and fourth Fridays of each month, in Hotel Pennsylvania, 7th Avenue and 33rd Street, New York, N. Y. Secretary-Treasurer, Franklyn MacStoker, 25 Princeton Street, Garden City, L. I. N. Y.

PHILADELPHIA meets fourth Friday of each month in Harrison Laboratory Building, University of Pennsylvania, 34th and Spruce Streets. Secretary, Paul Mentzer, Sr., 7242 Bingham Street, Philadelphia 11, Pa.

PITTSBURGH meets third Thursday of each month at 6:30 P. M., in Keystone Hotel. Secretary-Treasurer, R. A. Dimon, 210 Semple Street, Pittsburgh 13, Pa.

PROVIDENCE-ATTLEBORO meets the third Monday of each month in Providence-Biltmore Hotel. Secretary-Treasurer, Edward A. Parker, 15 Vale Ave., Cranstown 10, R. I.

ROCHESTER meets third Friday of each month in Hotel Seneca. Secretary, James Weaver, 884 Whitelock Road, Rochester 9, N. Y.

ROCKFORD meets second Monday of each month in Faust Hotel. Secretary, Vern T. Wissen, Forest Hills Rd., Rockford, Ill.

SAN FRANCISCO meets second Thursday of each month, alternating between St. Julien Cafe in San Francisco and Victor's and Roxie's Cafe in Oakland. Secretary-Treasurer, Jack Hite, c/o A. A. Plating Works, 1420 Harrison St., SanFrancisco 3, Calif.

SPRINGFIELD meets fourth Monday of each month in Hotel Charles. Secretary-Treasurer, L. R. Fountain, 15 Cortland Street, Springfield, Mass.

ST. JOSEPH VALLEY meets first Wednesday of every month at 8 p.m. in the Hotel Elkhart, Elkhart, Ind. Secretary-Treasurer, Harold J. Wiesner, 1016 Oslo Road, Elkhart, Ind.

ST. LOUIS meets second Wednesday of each month in York Hotel, 6th and Market Streets. Secretary-Treasurer, E. R. Hunleth, 4415 Michigan Avenue, St. Louis, Mo.

SOUTHEASTERN meets second Thursday of each month in Robert Fulton Hotel, 114 Lucky Street N. W., Atlanta, Ga. Secretary, William T. Weymouth, 173 Clay St. S. E., Atlanta, Ga.

SYDNEY, AUSTRALIA. Secretary-Treasurer, John Godfrey, P. O. Box 31, Auburn, N. S. W., Australia.

SYRACUSE meets second Friday of each month in Bowne Hall, Syracuse University. Secretary, M. P. Boland, Jr. 211 Rich Street, Syracuse 4, N. Y.

TOLEDO meets first Thursday of each month in the office of Vic Miner Company, 329 20th Street, Toledo, Ohio. Secretary, Gaston Bergeman, 703 Pine Street, Fremont, Ohio.

TORONTO meets second Friday of each month in Royal York Hotel. Secretary, Leonard W. Wray, 105 Ronan Avenue, Toronto 12, Ont., Canada.

TWIN CITY meets first Monday of each month, October through June, in Covered Wagon Cafe, Lodge Room, 114 S. 4th Street, Minneapolis. Secretary-Treasurer, Robert L. Buckley, 318 Builders Exchange, Minneapolis 2, Minn.

WATERBURY meets second Friday of the month in Elton Hotel. Secretary-Treasurer, Spencer L. Henn, P. O. Box Dr. B, Cheshire, Conn.

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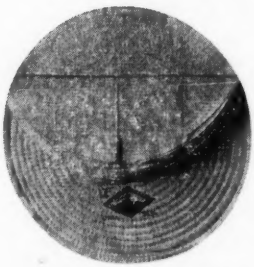
VERSATILE—ECONOMICAL—AVAILABLE



Spirally sewed, ⅜", ¼", in a variety of grades—Bleached, Unbleached, Colored . . . uniform in quality . . . excellent in finish . . . built in balance . . . full diameter . . . economical to use. Since 1892 the standard of quality in pieced buffs. Available for prompt shipment.

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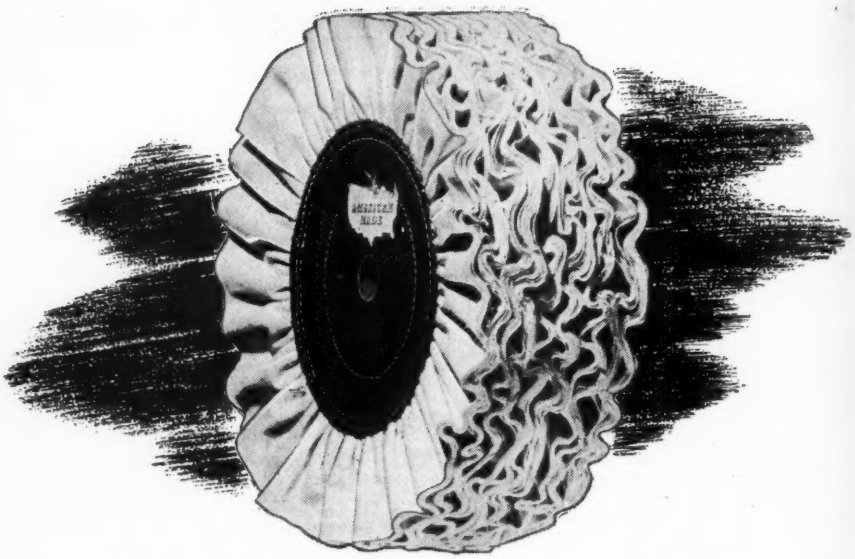

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The famous American-Made Amflow Bias Buff has long been distinguished for: Its sturdy construction, "Anti-raveling," air-cooled ventilation, efficiency, balance and long wear.

NOW—with additional material but same number of plies, the newly improved Amflow Bias Buff offers you the finest of cloth in a heavier weight, with a better face. This new Amflow means a faster "cut" and longer wear resulting in greater economy. Amflow is a "Precision-Made" Buff.

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LETTER FROM THE EDITOR

November 1, 1947

Dear Reader--

It wasn't so very many years ago that THE MONTHLY REVIEW was regarded as practically a secret publication, its contents jealously guarded by all Society members receiving it.

Fortunately for the science of electroplating and allied finishing fields, the era of extreme secretiveness has passed, and free interchange of information among those engaged in our industry today is welcomed and encouraged. The wide circulation of THE REVIEW today, in and out of this country, is an important factor in this spread of finishing knowledge.

It has been realized for some time that there is no convenient way for any plating and finishing shop to acquire copies for company use since memberships, other than Sustaining Memberships, are on an individual basis only. Accordingly, THE MONTHLY REVIEW is now accepting subscriptions from the many plants and shops who have expressed a desire to maintain copies for company use.

This is another step which THE MONTHLY REVIEW is taking to aid the Society in the fulfillment of its aim: "An educational society for the advancement of the science of electroplating and metal finishing." Reliable technical information is of little use if it is not available at the places where it is needed, and when it is needed. We feel that THE MONTHLY REVIEW is aiding materially in this educational program.

Sincerely,

Gustaf Soderberg

GHQ*

GENERAL HEADQUARTERS

FOR EQUIPMENT AND COMPOUNDS

MAC DERMID INCORPORATED, manufacturer of superior Compounds to meet your every Cleaning, Plating and Finishing need, is also New England Distributor for leading manufacturers of Metal Finishing Equipment. It is the General Headquarters for those who demand the best.

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ANODEX . . .
A reverse current process for electro-cleaning steel and copper. Effectively removes contamination without discoloration to basis metal.

METALEX . . .
A general all purpose cleaner that does not tarnish brass or diecastings. Does a great job on steel. Can be used as a soak . . . tumble . . . or electric cleaner.

BRIGHT COPPER . . .
Produces mirror-bright copper deposits from a simple cyanide copper plating solution over a variety of operating conditions. Operates at low temperature and low metal concentrations . . . with any conventional type anode.

Consult our Service Engineer in your territory, who is ready to call and demonstrate the advantages of these Compounds on your products with your equipment.

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WATERBURY 88, CONNECTICUT

BBZ-200 bright barrel zinc process

Zinc plating comes out of the barrel **BRIGHT!**

Right from the plating barrel *flashing bright* comes zinc-plated work processed this new H-VW-M way. Finished products plated by the BBZ-200 Bright Barrel Zinc Process *stay* bright longer, too . . . don't oxidize readily, resist tarnish.

Developed by H-VW-M expressly for barrel zinc plating only, this process produces its characteristic brilliant deposits over a wide range of current densities. Subsequent bright dipping is not necessary. ***Low concentration*** of BBZ-200 Brightener in the bath and ***low consumption*** add ECONOMY to the process's other virtues.

At no cost, you can learn how to get FINER RESULTS WITH YOUR PRESENT SOLUTION

Almost all existing cyanide solutions can be readily converted to yield the superior results that set the BBZ-200 Process apart. Send sample of your present solution to H-VW-M—without obligation or cost—for chemical analysis and recommendations for conversion.

Or, you can get the required chemicals, the BBZ-200 Brightener and the recommended ZA Anodes . . . together with instructions . . . from H-VW-M.

Get acquainted with this new way to ***brighter zinc deposits.*** Send sample of your present plating barrel cyanide solution for free analysis . . . or better yet, write for full details today.

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